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PART I.

ORIGINAL ESSAYS.

ART. XII.—*A reply to the objections against dry conservancy as urged by* Captain H. TULLOCH, R.E., *in Chapters III. and IV. of his " Report on a project for the drainage of the Town of Madras."* By W. R. CORNISH, Surgeon; Secretary to the Inspector General, Madras Medical Department; Author of " The Cleansing of Towns," &c. &c.

IN the beginning of the year 1864, when the Prison Committee of Bengal had reported so favorably on the system of earth sewage recommended by the Rev. H. Moule, and when the general introduction of the system into our Military Cantonments, Hospitals, and Jails, was officially ordered, it occurred to me that a simple explanation of the principles on which earth sewage was applicable to tropical countries might be found useful by those entrusted with the execution of the experiment. Hence the publication of my pamphlet of twenty-four pages of original matter " ON THE CLEANSING OF TOWNS," in which I advocated, on what appeared to me to be sound scientific principles, the peculiar suitableness of the dry system for the removal of human waste from large or small populations within

tropical latitudes. In taking upon myself this self-imposed duty, I had no other object than to make known, as widely as possible, the advantages of a practice which, immediately I had read Mr. Moule's paper, struck me as the one thing wanting in the admirable system of dry conservancy advocated by Dr. Hathaway, with which every body in India was more or less familiar.

In the month of July 1863, I reviewed Mr. Moule's paper, in a series of articles contributed to the "*Athenæum and Statesman,*" and so far as I am aware, may lay claim to the credit (if there be any) of being the first person in India to recognize, and publicly point out the value and suitableness of Mr. Moule's suggestions, in regard to Indian conservancy. More than this, however, I do not claim. I decline "with thanks" to mount the high pinnacle which Captain Tulloch has been so good as to assign me in the following passage, (p. 73):—

"Throughout this report I have argued the question of "universal dry conservancy or sewers" as against Doctor Cornish, considering that by the publication of his pamphlet on the "Cleansing of towns," he has, as it were, constituted himself the exponent and advocate of the former system in Madras; and while doing so, I have at the same time endeavoured to meet all the objections to sewers, which I have heard or seen stated, by those who have adopted the new theory. Having been entrusted by Government with the preparation of a project for draining the town, I have felt it incumbent on me to go into the question of dry conservancy very fully, as my silence on the subject might have been construed into an admission on my part, that drainage by sewers was not the best, the *only* means of cleansing the town. I am not aware that any other gentleman besides Dr. Cornish has really proposed to dispense with sewers."

Captain Tulloch's official report consists of 120 pages of printed matter. Of these, fifty-four pages are devoted to a criticism of my pamphlet, and to arguments showing the impossibility of dry conservancy being applied to a town like Madras.

In connection with this subject, Captain Tulloch has been good enough to single me out for especial notice, and to argue the points at issue in a personal tone, as against myself. My first impression was to take no notice of an attack of this nature, but as many of my friends thought that my silence might be misconstrued, I had no option but to

reply, lest it should be inferred that Captain Tulloch's statements and figures were unimpeachable.

By the publication of the pamphlet which has been such a stumbling block in Captain Tulloch's path, I claim to be responsible only for the facts and opinions that I have given expression to, and not to Captain Tulloch's or any other persons inferences drawn therefrom. I object *in toto* to having words put into my mouth, which I never used, and to be represented as the only gentleman " who has really proposed to dispense with sewers," when, in point of fact, I never entered into the discussion of the means to be employed to drain the town of its waste water. I can understand and make allowances for Captain Tulloch's warm advocacy of his own scheme for the drainage of the Presidency town. He had been engaged for many months in planning a system of sewers, and had laboured zealously at his vocation, when my pamphlet, advocating " dry," instead of " wet" sewage, appeared. It was no doubt a most important thing for Captain Tulloch to demonstrate that dry conservancy would not do all that its advocates gave it credit for, otherwise much of his toil and labour in the designing of plans, and in the calculation of estimates would have been wasted; but in criticizing my pamphlet I have to complain that Captain Tulloch has, in putting forward his own views, and unintentionally no doubt, unfairly represented some of the more important points wherein we differ, and that the calculations he has gone into to prove the absurdity of a proposition to rid a large town of animal excreta by the "dry" method, are useful only as a warning to those who rashly appeal to figures without making quite certain that the data on which they base their calculations are correct.

From some statements in Captain Tulloch's report, (which have no immediate reference however to the points in dispute between us), it may be shown that his method of dealing with figures is, to say the least, peculiar, and such as to suggest a doubt whether he really understands some of the questions on which he has pronounced such decided opinions.

I shall refer to two instances only, for I desire to keep my remarks within readable compass. At page 15 of the report, Captain Tulloch gives a table showing what he believes to be the average population per house in Madras. In order to arrive at this desirable result, his course of procedure is note-

worthy more for its simplicity than its accuracy. He takes the number of houses assessed by the Municipal Commissioners, and the population of each assessment division, and divides the latter by the former. There would be no objection whatever to this formula, provided that all the members of the population lived in houses borne on the assessment books of the Municipality. But unfortunately for Captain Tulloch's figures, and the conclusions he draws from them, nothing could be more remote from the truth. A note from Mr. Jesudasen Pillay, one of the Municipal Commissioners of Madras, informs me that "no house, or hut of less estimated annual value than 14 "Rupees, is borne upon the municipal books," and he adds, "*There is no doubt that some thousands of huts in the city* "*do not appear in our returns.*"

Of this fact, Captain Tulloch might easily have satisfied himself. He must have spent months of his time in the survey of the city, and in visiting portions of it which are rarely seen by Europeans. He must have noticed in every direction the collections of mud huts, the "coopums," and parcherries—all teeming with human life, but the buildings in which are ignored by the Municipal officers in their assessment returns, and yet with these facts staring him in the face day after day, and week after week, he can draw no other conclusions from his table of houses and population than the following :—

"In London the density of the population, with reference to the houses, is about five. A Madras dwelling, therefore contains more than two-and-a-half times the number of people which a London house does. The density of the population of the Northern portion of Madras, 20·7 (per house) is extraordinary, being more than four times that of London. Even this is rivalled by some of the villages, such, for instance as Royapett, which has a population of 19,210 and only 620 houses, the density being nearly thirty-one. Is it possible that a population of nearly twenty thousand can be living at the rate of 31 in a dwelling, and *such dwellings*? and if this is the average density over the entire village, how many men, women, and children must there be in some of the houses? It is not surprising that Cholera should be endemic in Madras."

It will be seen that Captain Tulloch has conjured up this terrible monster of overcrowding in houses, without the slightest foundation in fact. The northern district of Madras, he says, is more than "four times as densely populated as London!"

This, it must be remembered, is the deliberately expressed opinion of an officer who has surveyed the district, and who might reasonably be supposed to be gifted with ordinary powers of observation and comparison. If Captain Tulloch had not been so ready to appeal to figures in this matter, without a due consideration of their real import, he would not have committed himself to the use of such strong language, on so slender a basis of fact.

The real truth, with regard to the density of population in Madras, can never be known until all the temporary huts, which afford shelter to so many thousands of the population, and which the Municipal Commissioners deem unworthy to be taxed, can be counted. Even in regard to the "assessed" houses, great variations take place year by year. In 1854, the number of "assessed" houses was 32,949. In 1863, as Captain Tulloch states, the Municipality taxed 32,610 houses. In 1867 Mr. Jesudasen tells me the numbers have fallen to 31,600.

But besides the untaxed mud huts, there are other sources of error. Thus the population within the Fort is counted in the general population returns, but the houses and barracks are unassessed by the Municipality. The vast number of native servants in the employ of European and East Indian families, reside generally in the quarters provided for servants, in the compounds of the several houses. In this way it would not be difficult to make out that the population of each house in the European quarters of the town, averaged from 30 to 100, yet it would be a false inference to draw from the fact, that overcrowding prevails in these establishments. Captain Tulloch's inference from his table is, that the population is too closely huddled together. I have shown that the table is based on figures which are worse than useless, because they tend to mislead casual readers of his report, and I deny altogether the assumption that the population of Madras—a town mainly built of one-storied houses, which occupy a considerable surface area—in any given locality is denser than that of a similar area in London. I believe that Mr. W. Huddleston, some years ago when Secretary to the Board of Revenue, went into a calculation to shew that the average population per house in the whole of the Madras Presidency was between five and six.

Leaving out of the question the exceptional instances of houses occupied by Europeans, and in which large

numbers of native servants are quartered upon the grounds, there is nothing whatever in the actual condition of the native community of Madras to justify the belief that the average house population is in excess of that of the country generally.

I trust that I have said enough to show that the theory of overcrowding in the houses built upon the twenty-seven square miles of surface, on which the city of Madras stands, rests upon the most slender basis of fact.

The second instance of inability to comprehend the meaning of figures is contained in the following passage, (p. 119):—

"It has been urged that the cost of draining Madras, according to this project, will amount to as much as the value of all the house property in it, and that it will be better to remove the town bodily, as the Americans remove their houses, than to attempt to drain it. It is best to meet arguments of this kind by facts.

"*The value of a house is usually considered equal to thirty years' rental.*" (The italics are mine).

"The number and yearly rent of all the houses in the town may be obtained by any one from the Municipal Commissioner's Office, and the value of all the houses will be found to be 850 lacs of rupees or 8½ millions of pounds sterling.

"Half a million of pounds sterling (the assumed cost of this project) is not 6 per cent. on the value of the houses at present, and a good system of water supply and drainage will raise their value in the course of a few years by at least twenty per cent."

As will be seen from the passage which I have emphasised by printing in italics, Captain Tulloch estimates the value of a house at thirty years rental, and accordingly by multiplying the rental of all the houses in Madras by thirty he arrives at the conclusion that the present value of the house property is 8½ millions of pounds sterling. Now if he had estimated the value of a house at its actual market price, it would have been much more to the point, than taking a fancy-value which no one in his senses would think of paying. I have known instances in England of *freehold landed property* fetching 33 years purchase or more, but even in that favoured country, where the progress of decay is less rapid than it is in Indian buildings, ten or twelve years rental or purchase is considered to be the outside value of even the better class of *house* property in town or country.

The redemption of assessment on *land* in this Presidency, under the waste land rules is fixed, I believe, at twenty-five years' purchase. When *land* is required to be taken up for public purposes in Madras, the Collector allows compensation at the rate of thirty years' rental. Hence, probably, Captain Tulloch's error in regard to the value of *houses*. It is a well known axiom with dealers in land and houses, that whereas investments in land may be profitably made to yield only from three to five per cent., house property never pays for wear and tear and deterioration, unless it yields from ten to twelve per cent. upon the capital invested.

Let me give instances :—

1. Some freehold house property in the city of London, (in which I had a personal interest) yielded in round figures a rental of £400 per annum ; when sold, it produced £4,200 ; but according to Captain Tulloch's calculations it should have been worth £12,000. Unfortunately for myself and others, the bidders at the public auction did not adopt his view of the value of house property. (I wish from my heart that they had !)

2. The house in which I have been living for some time past in Madras, is let at a yearly rental of Rs. 1,200. It has recently changed hands at the price of Rs. 10,000. The owner I have no doubt would have been very glad to have found somebody willing to pay Rs. 36,000 for it, instead of the actual market value of a *little more than eight years' purchase.*

But if well-built "brick and chunam" houses in Madras sell as they ordinarily do, for less than ten years rental, what shall be said of a vast majority of the tumble-down "brick-in-mud" or simply "mud-walled" structures in which the native community dwell? Can it be believed of these dwellings, many of them not exceeding the annual value of Rs. 14, that they are worth so much as ten years' rental?

In all probability a very large majority of the native dwellings are not worth more than from five or six years purchase, but as in a question of this kind, one can afford to be liberal, I will take the value of the whole of the house property in Madras *at ten years' rental*, and then ask Captain Tulloch what becomes of his estimate of the cost of drainage works being "not six per cent. on the value of the houses at present?" If the facts I have given in regard to the

value of house property be correct (and any house owner will admit them to be so), I contend that the cost of drainage works, to say nothing of laying on a water supply, accepting Captain Tulloch's own estimates, would be nearer twenty, than six per cent. on the value of the houses. I leave out of question here the fact that many of the most valuable house properties would scarcely come within the influence of Captain Tulloch's drainage works.

It is to me most unaccountable how Captain Tulloch could have committed himself to such loose statements and reasoning as in the examples I have quoted, but now that I have given illustrations of this gentleman's mode of dealing with facts and figures, of which everybody is competent to form a judgment, the task which I have before me of refuting his arguments about the value of sewers and sewage, and objections to dry conservancy, will be considerably lightened.

When Capt. Tulloch makes the important concession that Dr. Norman Chevers has "laid down the true principles on "which drainage in this country should be carried out" (p. 70), and when in making this concession he admits that

"*The feculent excreta* and every kind of solid filth, road "scrapings and sweepings, stable litter, the refuse of knack-"eries, markets, tan yards, *urinaries*, gardens and cook "rooms," should be collected and carried away in conservancy carts, he grants, in point of fact, all that I have ever contended for. I have objected on strictly philosophical principles, and in the strongest of terms, to the mixing of human excreta with water, in hot countries, with the view to their removal. I have stated in the Mortuary report for 1859, and again in my pamphlet "On the cleansing of Towns," that the question at issue of the suitableness of a European system of sewerage for India is really one of temperature. That in European and other climates, where water of low temperature can be used, noxious gases are absorbed by it and decomposition retarded, and that the use of water under such circumstances is the cheapest and the least offensive mode of removing excrementitious matters.

But I have pointed out that water of a temperature above 60° Faht. is,—as all Chemists well know—incapable of absorbing gases; on the contrary, that at and above this degree of heat it gives off any gases which it might have

absorbed at a lower temperature, and becomes a promoter of rapid decomposition of organic matters dissolved or suspended, and is therefore an unfit vehicle for the removal of excrementitious matters, which in hot countries are only too prone to become dangerous to the public health under the most scientific adaptation of conservancy principles.

If Captain Tulloch, or anybody else, can suggest any feasible arrangement by which the water supply of Indian towns and villages can be kept at a temperature between 40° and 60° Faht., I have not the slightest objection to his using sewers for the removal of the excretions of the people, but until the required low temperature of the removing vehicle can be secured, I do most decidedly protest against the application of the European system of sewerage with its closets and house drains, and admirable contrivances for the effectual spreading of epidemic disease, to Indian towns. And in using the term "European system of sewerage," let it be clearly understood that I have never said, nor ever meant to say, that the waste and soiled water of an Indian town ought not to be got rid of. Captain Tulloch has chosen to infer from some expressions in my pamphlet, that I have proposed to dispense with drains altogether. I have, in reality, done nothing of the kind. I have urged that the adoption of a sound system of dry conservancy would do away with the necessity for "costly" drainage works, and in this opinion I know that some Engineers of established reputation are quite prepared to support me. Now if I had said that "no drainage works were required," Captain Tulloch would have been perfectly justified in arguing that I had proposed to dispense with all drains, but I expressly guarded myself as I thought from this construction by the use of the adjective "costly," and considering that the system of conservancy advocated in my pamphlet, would leave little else but the soiled water and house washings to be disposed of, I was, I submit, perfectly justified in concluding that with modifications and improvements in the present system of surface drainage, which Captain Tulloch himself admits to be a necessity even with his own project, the waste water might be disposed of, without involving the Municipality in a debt of half a million of pounds sterling. Captain Tulloch's outside estimate of the cost of the "project" submitted to Government, a project which, by his own showing, is designed chiefly to remove the "waste water" of the town (see page 26) is

half a million of money. If so extensive a scheme be really necessary for the removal of the least objectionable of the ingredients of "sewage," then I am free to admit I erred in stating that "costly" works were unnecessary. But before acknowledging the necessity of so elaborate a scheme as Captain Tulloch's for the removal of waste water from the town, I should like to know whether, in the opinion of other Engineers who have considered the question, the surface drains of the city might not, as a preliminary measure, be re-constructed so as to be made effective for the purpose? Although Mr. Fraser promises to be able to supply water at the rate of 20 gallons per head to each house, it is certain that very many years must elapse before this amount of water will be consumed daily by the average man or woman. As yet, no water supply is laid on to the 31,600 houses, and it is evident that it will be long before even a tithe part of the house property can be so supplied. If the surface drains were well laid out on a proper system, it seems to my unprofessional mind, that water would not stagnate and ferment in them as is now the case; but granting that some putrefaction must take place, I should prefer on sanitary ground to have the gases of decomposition diffused through and diluted by the atmosphere rather than concentrated in tightly-closed drains.

My views on the drainage of Madras, which I recorded in an official report to Government about six years ago, long before "dry conservancy" or "earth sewage" were talked about, I will here quote, that my sentiments may not again be misrepresented or misunderstood. With all the subsequent attention I have given the question, and admitting to the full the mechanical difficulties in the way of administering an efficient system of dry conservancy, difficulties which I will presently discuss at some length, I see no occasion to modify anything in the following passage:—

"The mechanical and engineering difficulties in the way of a perfect system of drainage for this town are not perhaps altogether insuperable. The question has been discussed by able Engineers whose opinions are on record, but whose surveys and estimates do not come within the province of extra-professional criticism. Granting the practicability of an extension of the best known system of sewerage, it yet remains to be seen whether the *uniform high temperature* which obtains here, has been sufficiently considered as an important element in the success or failure of any of the proposed plans.

"Sewage matters in temperate climates, are carried away from the neighbourhood of large towns without much decomposition. The River Thames, notwithstanding its pollution, is inodorous in the winter months, and so long as the temperature of the water remains low. But after a hot summer, and when the temperature of the water rises to 65° or 70°, chemical changes proceed more rapidly, new combinations are quickly formed (some of them perhaps constituting the germs of epidemic disease), sulphuretted hydrogen is evolved, and the whole atmosphere of the river banks is poisoned by its offensive odour. In Madras this state of things is *permanent.* Water in contact with organic matters at a temperature of from 80° to 90° brings about almost immediate decomposition. The actual temperature of shallow pools of water, or of the fluid in open drains of this town may be easily ascertained by direct experiment, but there is no doubt it is just the kind of "gentle heat" which chemists employ, when they wish to procure artificial decomposition, and disengagement of gases in the laboratory. It is a question therefore, whether the most perfect system of drainage, even supposing the sewers to be flushed twice in the twenty-four hours, would relieve Madras entirely of the offensiveness which attends the rapid resolution of organic matters into their ultimate elements.

"There can be no question under such circumstances as to the propriety of a rigid exclusion of all solid refuse from the present drains, or those hereafter to be constructed. Drains at the best in this country are evils, but they become doubly dangerous when they serve as receptacles for human ordure and other animal refuse. For these matters nothing will satisfy the requirements of a tropical climate but a daily removal beyond the limits of human habitation, where they should be employed, in the way Nature intended them to be used, as fertilizers of the soil."*

It will be seen from the above that I expressed views very nearly in accordance with those which Dr. N. Chevers published some years later, in regard to the principles of conservancy applicable to Indian towns. Captain Tulloch unhesitatingly adopts Dr. Chevers' views as "the true prin-"ciples on which drainage works in this country should be "carried out, and the only broad principles on which suc-

* The sanitary regulation of the Divine lawgiver, recorded in Deut. chap. xxiii. ver. 12, 13, is as important to the inhabitants of crowded cities of the present day, as it was to the Israelitish host, some 3300 years ago. With all our talk about "sanitary science," we are forced to admit that the soil of our lands "without the camp," or "city," is the only fitting receptacle, for the decaying animal or vegetable refuse of crowded communities. The problem yet to be solved is, how to convey the refuse of large towns to its natural destination without impairing its fertilizing properties, or endangering human life? No system of drainage can be perfect, unless based upon a recognition of the fact, that the soil is Nature's great disinfectant and purifier.

"cess can be assured at least cost." These "principles" provide, amongst other things, for the removal by scavengers of the whole of the excreta of the population, while the liquid matters and waste water are taken off "by sewers of moderate capacity," secured against the ingress of storm waters, while the rainfall is to be carried off by open surface drains. In reality, then, it seems that we are all agreed as to the mode in which the solid refuse of a tropical town should be dealt with. I have attempted to explain that I have no objection to the employment of open channels of proper slope and suitable material, for the removal of the soiled fluids of houses. As a Sanitarian, I should prefer, whenever practicable, open, to closed drains, for the reason that in the former when foul gases are evolved, they are immediately diluted and soon oxydized by the atmosphere, whereas in closed drains, where the fluid is of high temperature, there is always great danger to be apprehended from the concentration of the gaseous fumes resulting from decomposition. My fixed objection is to the employment of water of permanently high temperature as a vehicle for the removal of the excrementious matters of a population. It is some little comfort to me to think, that although my arguments may appear insignificant to those unacquainted with the principles of chemical science, yet that I am fully borne out in my views by the unanimous decision of the members of the late Sanitary Conference at Constantinople. According to Dr. Goodeve, the Conference "objects to the system of drains or sewers in connection with houses," holding that in practice "we can-" not prevent the diffusion of noxious gases through the "houses in connection with them, and that in times of "cholera, drains may spread the disease along a line of "houses in communication with them; and that owing to "the porosity and rapid decay of masonry work, they "readily allow of the impregnation and saturation of the "ground through which they run, with decomposing "organic matters." If this is the case in regard to drainage works in temperate climates, what would be the state of things in Indian sewers, where the liberation of the gaseous products of decomposition occurs so much more rapidly? The suitability of water as a carrier of sewage in the tropics, let me remark, is a chemical, and not an engineering question, and those only who pretend to an acquaintance with the laws of chemical philosophy are competent to take part in its discussion. Captain Tulloch, I ob-

serve, in his chapter on "Objections to Sewers answered," has never once alluded to the chemical considerations involved. He does not get beyond the old stock argument that because water is an excellent carrier of refuse in temperate climates, it will be equally effective in Madras, under climatic conditions wholly different.

All his examples of the efficacy of drainage works, and the utility of "sewage" as a fertilizer, are derived from England, where the temperature of the water employed, makes it well adapted for the object in view. I have already shown that cold and warm water have exactly opposite effects on the excrementitious matters of the human body; that the one retards decomposition, and that the other hastens it. The facts are incontrovertible, and upon a proper comprehension of them hangs the whole question at issue.

But Captain Tulloch may say of his project that he never contemplated the employment of water for the removal of the excrementitious matters of the town, and that he has expressly admitted that the "only true principle" of drainage in India, involves the maintenance of a huge army of scavengers for the disposal of these matters. There is, however, some appearance of inconsistency in regard to this portion of the project. In one place (p. 70) Captain Tulloch approves of the exclusion of urine from the sewers. In another (p. 106) he proposes that it shall be allowed to run into the drains, but does not explain the contrivances by which he would separate the fluid and solid excretions of the body. If Captain Tulloch really means to exclude the most fertilizing portions of the town sewage from the drains, why does he dwell at such length on the advantages of liquid sewage as a manure? We hear occasionally of the performance of the play of Hamlet, with the omission "by particular desire" of the part of the chief character, but Captain Tulloch is more ingenious still when he proposes to employ the liquid product of his drains, deprived of the essential elements of "sewage," in the fertilization of land.

He argues "that as river water in India applied to land will yield enormous profits," (p. 51) so must the waste water of the city. No doubt it would, provided it could be laid on in the ordinary way of irrigation, and that it did not cost many thousands of pounds to bring it to the point of distribution. But to expect the same results from fluid of this

kind, as from "sewage proper" with all its normal constituents unimpaired, shows, I am afraid, a very hazy and dubious acquaintance with the chemistry of the subject on the part of Captain Tulloch.

The application of liquid sewage to land in England has, I am aware, been a success under certain conditions as to soil and the nature of the crop cultivated. As a rule, the success has been greater in small than in large towns, and for this reason, that the human waste, on which the fertilizing power of liquid sewage mainly depends, has had no time to decompose, but has been diluted and applied to the land in a perfectly fresh state, with all its fertilizing properties unimpaired. Stiff clay soils, retentive of moisture, are said to be unsuited for the application of liquid sewage. The soil should be sandy, light and porous, and the crop which flourishes best under sewage irrigation is the Italian rye grass, which at Edinburgh, Carlisle, Croydon and some other towns, yields enormous returns.

As a rule, liquid sewage has failed when applied to root crops, and to grain, such as wheat or barley. It is found, practically, that it tends to the development of leaf and straw more than root or grain. For all practical purposes liquid sewage is employed mainly in the growth of green food for cattle, and for this purpose in the neighbourhood of towns it pays exceedingly well. Now for "sewage" to be of any marked benefit beyond what is obtainable from simple irrigation, it must contain something more than the dirty water which Captain Tulloch proposes to take out of town. Supposing, by way of argument, that Madras possessed a plentiful water supply, that it was laid on at high pressure to every one of the 31,600 houses, and to the public latrines, that each house or court-yard was fitted with a water-closet, cistern, drain traps, &c. complete, that the people used these conveniences, and that the whole of the excretions of half a million of people found their way into Captain Tulloch's drains:—

The "sewage" resulting might be thought most valuable, but is this quite certain? and does British experience help Captain Tulloch in coming to any trustworthy conclusions on the subject?

My reply is, that here again comes in the chemical question,—the influence of heat on organic matter in solution.

The most valuable constituents of sewage, in regard to the stimulation of green crops, are the nitrogenous matters which represent the human waste of large towns.

Now what would be the probable fate of the enormous amount of feces and urine sent into the drains every day? Every-body knows that urine is one of the most unstable of animal compounds, that at a high temperature and in the presence of decomposing matter, its elements split up and re-arrange themselves, that urea is converted into ammonia, that free ammonia escapes in large quantities or combines again with other unstable compounds, that in a few hours the greater portion of the most valuable ingredients of sewage would, at a given temperature, be dissipated in the form of gas or vapour which, with other gaseous products of decomposition would press back and pass through the water of the trapped drains, into the court-yards and house enclosures, or pass off into the air by the ventilating shafts in the sewers. Most people have an idea of the horrible odours of London houses on a hot September day, due chiefly to gaseous eruptions from sewers, but what is the temperature of the contents of sewers in London compared with the same in a place like Madras, where the mean temperature of the air is 80°? If sewers are offensive in English towns when the weather gets warm, they must become doubly so in Indian towns which are never cool. The more rapid the decomposition of the constituents of sewage, the less valuable will that fluid be for the purposes of the cultivator. If the ammonia escapes in a gaseous form, it is evident that it can't be applied to the fertilization of the land. The only practical evidence on the use of liquid sewage in India, with which I am acquainted, is contained in the "*Correspondence on the subject of the drainage of Bombay.*" It will be seen from the annexed extract that the results of the trial in that town were quite in accordance with what might have been expected, supposing my arguments against the use of water for the removal of sewage in tropical countries to be founded on objections based upon natural laws.

"Mr. Conybeare in 1853-4 attempted the application of the liquid sewage as manure in combination with an arrangement for obtaining an artificial current in the main drain.

"The sewage passing down the drain was intercepted by a transverse cut, or catch-water drain, and conveyed to filters constructed of sand and a peculiar trappite rock pounded into fragments. From

the filters it passed by its own gravity into a reservoir whence it was lifted by mechanical means, and allowed to flow over the ground to be irrigated. The site for these works was first near the Grant road, eventually some distance down the drain from the Bellasis road.

"It was assumed in this design for the disposal of sewage matter, that the benefits of irrigating with the water would readily be recognized by the cultivators; that the operations of the filter would be such as to render the filtered sewage inodorous, and that the artificial fall produced would have the effect of so far improving the main and branch sewers as to place the general drainage of the island on a comparatively satisfactory footing.

"The preliminary experiments, which appear to have been conducted by Mr. Conybeare with great care, *but on comparatively small quantities of sewage,* gave most satisfactory results. The sewage water issued from the filters quite inodorous, and heavy crops of vegetables were raised from the irrigated ground.

"*On the larger scale,* however, the sanguine anticipations of Mr. Conybeare were not answered by results.

"The irrigation, or rather the system which was at last adopted of allowing the sewage to flow at random over a salt morass—*in itself constituted a nuisance equal in intensity to that arising from the former state of the drain;* cultivators did not, in practice, appear to be conscious of any benefits to be derived from liquid manure.

* * * "The cost of these works being very heavy and their results quite incommensurable with that expense, they were closed by a resolution of the worshipful bench in 1855 or 1856." (The italics in this quotation are my own.)

Messrs. Wilcox and Tracy further add, as a reason, for not taking into account the use of liquid sewage for application to the soil:—

"Independently of the cost of supplying liquid sewage on a systematic plan of distribution, which method, on any except a very small scale, has been disposed of effectually some years ago, we are of opinion that the habits and ideas of Hindoo cultivators would require considerable education, before they would to any great extent adopt it. It is further a question whether years must not elapse before such valuable crops could be cultivated as would enable the cultivators to pay a covering rent for the use of the sewage water, during the whole of which period the distributory apparatus would remain a heavy charge on the Municipal or Government Treasuries." * * *

"Finally the distribution of liquid sewage as manure in large quantities, and without creating nuisance, has never yet been proved possible."

In this latter conclusion Mr. Robert Rawlinson, C.E., who was consulted by the Secretary of State for India in reference to the Bombay drainage scheme, did not concur. He does indeed casually recognize the fact, which I have taken so much pains to insist upon as the initial difficulty of all drainage works in India, namely, " the liability of injury to human health " being in proportion to the temperature of the atmosphere," but he argues that the sewage should be disposed of, if possible, " with advantage to the district." If this cannot be done, " then with the least possible injury."

A remark in the Bombay report, from which I have just quoted, reminds me that a very large proportion of the land upon which Captain Tulloch proposes to distribute the Madras sewage (see plan, page 110), is unsuited for the purpose. The soil on both sides of the northern canal is a stiff, unworkable, non-absorbent clay; the soil, in fact, which of all others is the least suited for sewage irrigation. Another more serious objection, is that the land lies so low, that it is invariably flooded by heavy rain, or by the overflow of the Courtelliar river. I have known three feet of water to stand on the identical spots shown in the map, as suitable for sewage irrigation, and the whole area to resemble a shallow lake for days together. The overflow of river water, mixing with that of the backwater and canal, makes the whole brackish. The land flooded by it is barren and unfertile, as any one may notice, who will take the trouble to examine the locality. The tract of sandy-soil nearer the sea would, in my opinion, be much better suited for the trial of sewage irrigation, supposing that Captain Tulloch's suggestions are ever carried out.

I think Captain Tulloch deserves much credit for attempting to work out the details of a system, which provides for the exclusion of the storm-waters from underground sewers —the rock, it seems to me, on which all former drainage schemes in this country have been wrecked. When in Calcutta last year, I was not a little astonished to observe a huge sewer being constructed from the southern end of the " maidan" along by the Race-course and General Hospital down the " Circular road," to join the main sewer leading away to the salt lake. This branch was big enough to enable me to walk upright in it, and in the upper part of its course, I have no hesitation in saying that the " sewage proper" of the locality might have been removed in a six inch

pipe. There is literally no population there to furnish sewage, and as I was given to understand, this enormously expensive sewer was made of its present capacity simply to carry off the pure rain water falling on the "maidan" in the monsoon months.

No wonder that the main outlet sewer in Calcutta requires, as Captain Tulloch states, to be "thirty feet wide," nor can we feel any surprise in learning that the adoption of this principle of drainage in India has already saddled the Municipality of Calcutta with an expense of a million sterling, while the works are still so incomplete as to be useless to the town. By some statements which recently appeared in the "Indian Mirror," it seems doubtful whether the works will not have to be abandoned from want of means to complete the original design. The borrowed money has been all spent, and the credit of the Municipality is gone. In my pamphlet (p. 23), I remarked "there are not wanting men "of eminence in sanitary knowledge, who have from the first "prophesied that the Calcutta drainage scheme would end "in a gigantic failure." By all that I could see, and have since read, the prophecy will be fulfilled somewhat sooner than was anticipated.

I have no objection to Captain Tulloch's scheme, viewed apart from its suitableness to the physical condition of the town, and the social condition of the people of Madras. His estimates, I see, do not provide for the surface as well as house drainage. With a proper system of dry conservancy it seems to me that both might be combined. So long as the animal excretions of the body are not attempted to be removed by water, I have no wish to quarrel with any scheme that is really practicable in Madras, but I fear that Captain Tulloch's plan is one that does not come under that category.

The important questions in regard to his project are (1) who is to pay for the improvement? and (2) are the circumstances of the great bulk of the people of Madras such as to warrant the supposition that they can afford the cost? It seems clear that the inhabitants of the Presidency town have no more claim to a grant of Imperial money, for the prosecution of drainage and water-supply works, than have the inhabitants of the smallest village in the provinces. The villager contributes as much, or more perhaps, to the Imperial revenue as the townsman, and has equitably the same claim as the latter for the Government assistance in keeping

his premises clean. In the cases of Bombay and Calcutta, the Municipalities have undertaken to raise the necessary funds for the prosecution of drainage works, and by no kind of special pleading with which I am acquainted, can a fair case be made out in favour of Madras being drained at the expense of the Imperial revenue. I know that the fact of Madras being the seat of Government is considered by some to be a sufficient argument for spending public money in keeping it clean, but on exactly the same principle, the cost of the London drainage works might be debited to Imperial rather than to Municipal revenue. What would the people of fifth or sixth rate towns in England say, if a proposal was made to drain London at the cost of the nation, simply because the houses of Parliament are located within the metropolis ?

If it be admitted then that the residents in one form or another, must bear the expense, let us consider briefly whether their circumstances are such as to enable them to undertake a work of such magnitude, as the construction of underground sewers for the enormous area covered by Madras. The town stands on twenty-seven square miles of surface. How thinly this area is in part populated may be imagined, when it is stated that out of the 17,280 acres of land included within the town limits about 3,521·9 acres, or one-fifth of the whole, are devoted to "wet" cultivation. Madras, in fact, is made up of a number of villages, and thinly populated agricultural tracts, which connect three almost distinct towns (Triplicane and Chintradrepett), (Periamoot, Vepery and Pursewakum), (Black Town and Royapooram). The great bulk of the people are so poor, that out of a population supposed to number nearly half a million, they can only afford to maintain 31,600 houses of, or above, the estimated value of 14 Rupees rental per annum. In this number are included the most valuable properties—the residences of the European and East Indian population—of the people who live in detached houses, widely separated from each other by "compounds" or enclosures, and which, from their position, can derive little or no benefit from the drainage works. Captain Tulloch says, "there must be 140 miles "of sewers or pipes, or if not, some parts of the town must "be left undrained. For whatever sum of money 140 miles "of drains can be laid down, for that sum only and for no "less can Madras be drained."

I notice that the Hon'ble Mr. Ellis states that there are 267 miles of public roads in Madras. The length of sewers required is therefore probably understated by Captain Tulloch.

But the mere construction or laying down of street drains is not the only expense that will have to be considered in a system of sewerage. Captain Tulloch has, so far as I am aware, given no estimate of the additional cost falling on the 31,600 house-holders, which would have to be incurred before the house drainage could be brought into communication with the public sewers.

It is suggested that three or four inch earthen pipes leading from the back yards of native houses to the street drains should be laid down "under the immediate direction of the Municipal Commissioners," but the cost of this operation, and of draining the thousands of buildings which are not entitled to be dignified by the name of "houses," is nowhere given. It is manifest that the cost of such works must depend upon the amount of excavation required and the length of piping necessary to join the public drain. In a large number of houses in the thinly populated districts, this expense would, from the distances involved, be very considerable. Assuming roughly that the average expense per "house" under this head, including alterations in the back yards to exclude storm water, sinks, traps, &c. would be 50 Rupees, then Rupees 15,80,000 would have to be added to the estimate. It is useless to argue, as Captain Tulloch does, that it is not his business as an Engineer to estimate for such things. The house owners, or Municipal Commissioners would have to pay for them, which is after all a consideration that closely concerns them. Without bringing the house drains into communication with the sewers, it is obvious that the latter could be of no use. I say nothing here about the introduction of the water closet system in connection with houses and public latrines as proposed by the Editor of this Journal in his late review of Captain Tulloch's project. Each house would require at the least a double apparatus of the kind; one for caste people and one for servants, and what with the laying on of water at high pressure, the provision of cisterns, closets, and all the paraphernalia of modern drainage according to the European system, it must be evident that as regards a very large area of the house property, the expenses would, as has been

apparently already pointed out to Captain Tulloch, exceed the value of the houses.

It must not be forgotten in the consideration of this question that the whole of the house sewage works would have to be supervised by imported skilled labourers,—that a large number of plumbers would be necessary to put up the apparatus and to keep them in repair. The people of Madras, I maintain, are not yet so advanced in civilization as to be able to appreciate a system of conservancy opposed to their prejudices and ancient customs, and which system, on purely scientific grounds is, I believe, unadapted to towns in the tropics.

I admit that property is increasing in value in Madras. The assessment of 1854, (which, however, did not include the whole property of the town) estimated the annual rental at 25½ lacs, or taking the liberal estimate of ten years' rental, at about 2½ millons of money.

The assessment for the present year, which however includes lands as well as houses, is based on an estimated rental of about 31½ lacs. So that it is not improbable that the property, land and houses, may now be worth about three millions. Allowing, for the imperfect assessment of 1854, the value of house and landed property in Madras, has perhaps increased by about twenty per cent. in the last thirteen years, but this increase is due more to the general advance in prices of labour and of all articles of supply in the country generally, than to any thing peculiar in the town itself. The population, as a rule, is not better housed now than it was thirteen years ago; on the contrary, from the gradual decrease in the number of houses eligible for assessment, there is every reason to conclude that the enhanced cost of building materials and labour has had a marked effect in deteriorating the quality of the native house property generally, and that the people are less able to afford to spend money in solid work now than they did in years past. These considerations go to strengthen the supposition that the residents of Madras are wholly incapable of meeting the enormous expense which a project, such as that of Captain Tulloch's, must of necessity entail. If the people cannot pay for the works, and the State should refuse to defray the cost, it will be necessary to fall back upon some less expensive scheme for ridding the thickly-populated parts of the town of waste water, and to devise more

efficient means for carrying out a proper plan of house and street conservancy, so as to ensure, as far as possible, that purity of surface soil, without which we can never hope to be freed of the endemic pest, cholera, a pest which flourishes so abundantly in those portions of the town where sanitation has never had a chance of contending against it.

I now come to consider the validity of Captain Tulloch's objections to the removal of the excrementitious products of the population, by the dry method. The objections, in fact, can scarcely be said to exist, and are of no weight whatever, for he admits that he is "entirely in accordance with the advocates of this system," (p. 22) except in the question of expense, which, in one portion of the report, it is attempted to show would be a much greater burden upon the people than the establishment of a complete system of sewerage by water. Now if I can show that there are glaring inconsistencies in Captain Tulloch's statements about the expense of the dry method, and if I can establish that his estimates of cost are based upon wholly fallacious data, it must be conceded that his objections, such as they are, fall to the ground, and that the possibility of establishing a system of dry conservancy is in no degree affected by what Captain Tulloch has advanced.

A terrible stumbling block in Captain Tulloch's way, appears to have been a suggestion of my own for the establishment of public latrines on a more efficient scale than now exists, to be worked by the dry earth method. I have nowhere contended that these public establishments should be resorted to by the whole population. I expressly pointed out (p. 19) that the principles of the dry earth method are excellently adapted for "private establishments;" and (p. 24), "that private families adopting it should be compelled to provide themselves with receptacles for fluid and solid excretions of an approved pattern, to be removed daily by the conservancy establishment." I knew, perhaps better than Captain Tulloch did, that Madras contained a large nomadic population,—that many thousands of the people lived in places which could scarcely be regarded as houses—and that they had no places of resort but the roadsides and latrines set apart for the purpose by the Municipality. My recommendation simply amounted to the making of public provision for this class, numbering perhaps from one-eighth to one-fourth of the population. Captain Tulloch, however, says that the entire "success of the scheme will

depend on a universal use being made of the public latrines," (p. 28) and having, out of the depths of his own consciousness evolved this startling doctrine, he proceeds to denounce the immorality of dry earth conservancy, in the following fashion :—

"Can it be expected that any respectable man will permit his wife or his daughters to leave the privacy of their home—to walk, say 150 yards in dry and wet weather along a public street to a public place *for such a purpose*—to mix there with perfect strangers —and to perform such a duty in their very presence. Yet, if the women as well as the men did not use the privies, what measure of success would attend the introduction of dry conservancy ?

"The advocates of this system may point to the fact that the existing public latrines are made use of by women, which is perfectly true : but it is by women of the very lowest classes, and by such of them as have no back-yard or enclosure of any kind to resort to. (Exactly the classes, in fact, for whom I suggested the erection of properly-constructed and well-managed latrines.) "And even these women are driven to the public privies only by the strict supervision of the police. Instead, therefore, of encouraging what every one will admit is a proper sense of decency, dry conservancy proposes to lower all classes to the same degrading level. Surely this is a backward step in civilization. Let it be remembered too, that children and young girls are to be subjected to this public ordeal. To what a state of morality must this lead (p. 28, 29)."

In the face of these highly proper reflections, I may perhaps be permitted to suggest that the class of females, who require "to be driven to the public privies" by the police would, on the whole, be more likely to gain in habits of decency and self-respect by frequenting a well-managed public latrine, than by performing natural functions in public thoroughfares as Captain Tulloch admits to be now the practice. The very "tall" talk in which Captain Tulloch indulges, with regard to the degradation of respectable women is somewhat beside the question, because nobody that I am aware of, has ever proposed so foolish a thing as the compelling of them to resort to places, designed for a wholly different class. I have quoted the remark as an illustration of the manner in which my antagonist converts mole-hills into mountains, when it suits his purpose so to do.

Having decided to his own mind satisfactorily that every inhabitant of Madras is to use a public latrine, under penalty, Captain Tulloch goes on to make elaborate calculations as to

the number of latrines required for 430,000 people, and the cost of construction and management, and the carting away of excreta, &c. and arrives at the conclusion that the total cost would be 75 lacs of rupees according to what he terms my plan, and 258 lacs of rupees according to the data afforded by some experiments conducted under the direction of the Sanitary Commission. It is scarcely necessary to follow Captain Tulloch in his calculations, because as he has taken figures which are worthless for estimating the expenses of the system, it follows that the results arrived at must be wholly unreliable. I shall examine this subject more fully by and bye, but I wish here to notice how inconsistent Captain Tulloch is with himself. Having shown that dry conservancy is too costly a business for the town, that, in fact, the expense of it would be far beyond the means of the people, were they twenty times as wealthy as they are—he elsewhere (p. 107) says that the cost of removal of the excreta "would really be most trifling." It must be remembered that Captain Tulloch in addition to his house drainage works, proposes a continuation of the present system of removing all solid refuse. In discussing this part of his plan, the difficulties and expense of dry conservancy vanish as if by magic. Lest I should be accused of misrepresentation, let the following quotation speak for itself. (The passages to which I would call attention are italicised by myself, not by Captain Tulloch.)

"For the removal of the ordure I would encourage as much as possible *the system which obtains at present throughout the town, but I would at the same time try to improve it.* The abominable smells in all parts of Madras are not produced, as is generally supposed, by the excreta of the population, but by defective drainage. It is the *refuse water* in the houses and in the streets into which all manner of garbage is thrown to ferment and generate foul gases, that creates the dreadful nuisance complained of.

"What is chiefly required to prevent excreta producing a nuisance, is a constant inspection of the privies in the dwellings. Although the ordure is removed daily, yet the privies themselves are not kept clean; very often there is a stoppage in the channel which carries away the urine, or the ordure is dropped on the bare floor, from which it is impossible to remove it altogether. Now if the Municipal Commissioners would organize a system of inspection and insist upon every house-holder keeping his privy in a wholesome state, he might soon get rid of the soil. *Of course the use of clay, ashes, &c. should be encouraged as much as possible.*

"*This would be nothing more than the dry system applied to dwellings, and would have this advantage, that each house-holder would be saddled with no more than the expense of removing the nuisance produced in his own house and by his own family. The cost of this plan to the Municipality would really be most trifling.* (p. 107)."

I leave to Captain Tulloch the task of reconciling his original statements of the cost of dry conservancy and the admission as above that the cost to the Municipality would really be most "trifling." The only difference I find between Captain Tulloch's proposition and my own is, that he would allow the urine to fall into the sewers, whereas I suggested that it should be removed for conversion into manure with no admixture of water. With all deference to Captain Tulloch's arithmetical ability, I cannot quite see how the removal of the excreta from public latrines should cost 75 lacs of rupees, while the collection of the same from each individual house would be but a mere trifle.

He repeatedly ridicules my suggestion that the rate-payers would do well to enquire "whether for the expenditure of one-twentieth part of the cost of the proposed drainage works, Madras might not be made a model of cleanliness and its excreta so valuable, that the cost of collection should be a mere trifle in the Municipal expenditure," and yet in the passage I have quoted, Captain Tulloch makes the damaging admission that dry conservancy might be applied to the town at a "most trifling" cost !!

The necessity of a systematic inspection of privies in private houses was pointed out by me some years before Captain Tulloch's report appeared, but as will be seen from the foot-note appended, Government distinctly declined to sanction the proposition made by me, to effect this desirable object.*

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* "The Municipal Act further empowers the Commissioners to punish by fine all instances of neglect to remove filth (Sections 40 and 41) from houses or grounds, when such may be offensive or injurious to health, but the machinery for carrying out this authority would appear to be defective. It always must be so until Health Inspectors are appointed, and armed with authority to inspect the *interior* of native dwellings. It is impossible to certify to the cleanliness of any native house from a simple observation of its exterior, while the elements of disease and death may be rife within, but studiously concealed from view.

"These remarks apply especially to the prevention of Cholera, a disease which, for many years past, has been fearfully destructive of life in the city of Madras. With the example before us of what has been done in the way of *keeping out* Cholera from the European Barracks in the Fort, since 1859, there

Captain Tulloch's estimates of cost of a system of dry conservancy, as proposed by myself, are all based on assumptions of his own, in every one of which there lurks a fallacy.

He begins by assuming that every member of the population must resort to a public latrine or public urinal, then that a latrine of given dimensions must necessarily cost a certain sum. Then he assumes that 645 public urinals, distinct from latrines, would be wanted, each to cost Rs. 400. Then that a certain amount of space would require to be taken up for building all these latrines and urinals, and that the land which he has valued for the whole town at Rs. 250 "per ground" would cost more than five lacs of rupees. Then as regards the actual carting in of earth and removal of excreta, it is assumed that bullock labour and country carts are the most economical means of removal, and that, with all our boasted skill in the adaptation of mechanical means to the requirements of civilization, we are to be content with a pair of bullocks drawing "a load of half a ton." In this way, and by a questionable process of "capitalizing" the annual expenditure for labour and bullocks, Captain Tulloch has arrived at the grand result that my scheme of dry conservancy would cost 75 lacs of rupees. This too while he states that the removal of all the solid excreta from house to house would be but a mere trifle to the Municipality. The whole of these calculations may be regarded as an abuse of figures, and it is unfortunate for Captain Tulloch that in recommending his own scheme, he should have condemned his own estimates regarding dry conservancy, by admitting that the removal of the solid refuse would be a "most trifling cost" to the Municipality.

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need be no hesitation in trying to accomplish a similar work for the denser parts of the town. The example is sufficiently encouraging to warrant any reasonable expenditure having for its object a pure water supply and improved drainage, plenty of fresh air in streets and houses, and simple and efficient means for keeping the town free from fœcal filth.—*Mortuary Report for* 1861.

"The attention of the Municipal Commissioners will be drawn to the suggestion made in the first part of paragraph 12, which seems one that may easily be carried out and is likely to have good effect; but the Government are not prepared to sanction Dr. Cornish's proposal to authorize the inspection for sanitary purposes of the interior of private dwellings.

"The occupants of houses who, by any act or omission, create or allow to arise within their premises any thing that becomes a nuisance to others or the public, are of course liable to inspection and, it may be, punishment; but an organized inspection of private houses by public officials would, even if practicable, be open to much abuse."—*Extract from Government order thereon,* 1863.

With regard to the figures in the report of the Sanitary Commission, and the experiments in earth conservancy at the General Hospital, to which Captain Tulloch alludes as giving him the data for an estimate of 258 lacs of rupees, (pp. 40 and 41) I have only to say that I do not hold myself responsible for the one or the other, and that subsequent experience in other places has demonstrated the utter worthlessness of the experiments, in regard to the question of cost.

Actual facts in regard to this question of expense are worth more than all the theories in the world. Let us hear what a gentleman who has actually carried out the earth system of conservancy for a large Military cantonment, thickly crowded by native bazaars, has to say on this point, and let the reader carefully contrast this gentleman's practical experience with Captain Tulloch's theoretical objections.

MEMORANDUM

On the Native latrine system, as carried out at Morar, Gwalior, forwarded to the Adjutant General, in obedience to his No. 5300 of the 25th July 1866.

1. The station of Morar, surrounded as it is by large villages, and having large bazaars in its centre, and moreover being intersected in every direction by ravines, which were the resort of every native for the purposes of nature became so offensive, that it was absolutely necessary to adopt remedial measures.

2. The following course was initiated, and found to work well.

3. A tax of one Anna a head is collected from all native adults (male and female), resident within Cantonment boundaries, and from all children above ten.

4. Quarter Masters of Regiments collect from all natives in their lines, including Regimental bazaars, and forward to Cantonment Magistrate. This latter Officer through a Moonshee (who receives eight per cent. on collections for his trouble) collects from Sudder bazaar, and all natives not living in Regimental lines, and keeps the accounts of the whole fund.

5. All collections are ordered to be paid in on the 20th of the month for the preceding one.

6. Small private latrines are allowed in compounds of Officers (for servants) and also in compounds of rich natives in bazaars on payment of a fee of 4 Annas per head, by special permission—the

occupants of the house building the latrine, and the conservancy being carried out by the station establishment.

7. The whole of the working of the establishment, payment of of them, &c. &c. rests with the Cantonment Magistrate and his subordinates, but Quarter Masters are held responsible for the latrines in their lines, and correspond direct with the Cantonment Magistrate on the subject. The Conservancy Serjeant is under the Cantonment Magistrate and his Principal Assistant in the scheme.

8. Every Native within the Cantonment pillars is compelled to pay this tax, with the exception of the Native Regiments, who are invited to do it voluntarily; and in this district, they all, without any exception, prefer paying the one Anna for the convenience of having latrines in their lines, to the great inconvenience of having to go beyond Cantonment boundaries for the purposes of nature.

9. The female latrines are separate from the men's, and it is generally found that two mehters with their wives, on a total monthly pay of 14 Rupees, are sufficient to keep clean a latrine used by 2,000 people.

10. The system carried out in these latrines is the exact counterpart of the one existing with British Regiments.

11. The filth is deodorized with dry earth kept in a shed attached to the latrine (the carts on return from the pits bringing the same). It is kept in receptacles and carried away in filth carts to the pits.

12. The carts are supplied by Government, the receptacles, privy pans, &c. &c. are kept up and purchased from the proceeds of the fund, the utensils used being exactly of the same pattern as those employed in British Regimental lines.

13. The cost for the erection of a latrine varies necessarily according to its size—the largest one in use here is 167 by 20 feet, cost about 250 Rupees.

14. The total cost for the erection of latrines, purchase of receptacles, privy pans, and bullocks at this station, amounted to about Rupees 7,000, which sum has been advanced from local funds.

15. The monthly excess of income over expenditure averages 180 Rupees; but from this, the repairs of conservancy utensils and latrines, and the wear and tear of bullocks has to be defrayed.

16. It will be seen that the only assistance that Government affords to the latrine system for natives, is the use of its carts; every other expense incurred being paid out of the latrine fund. This fund has now been incorporated with the grazing fund, in

accordance with a communication received from the Quarter Master General, that in the new Cantonment Regulations about to be published by Government, the native latrine system will be made compulsory.

(Signed) H. TOMBS, Brigadier General,

Comdg. Gwalior District.

Dy. Asst. Qr. Mr. Genl.'s Office,
Gwalior District, Head Quarters,
Morar, 11*th August* 1866.

In communicating this "memorandum" to the Madras Government, the Governor General in Council caused the following observations to be made for the consideration of our local authorities:—

"With reference to the memorandum from your office, No. 2199, dated 27th June 1866, I am directed to forward, for communication to the Right Honorable the Governor in Council, the accompanying memorandum on the conservancy system, which was introduced by Brigadier General Tombs, C.B. and V.C., at Morar, and which has been attended with such remarkable success as to call forth a special expression of His Excellency the Commander-in-Chief's approval.

"Without insisting on this plan being followed out in all its details, the Government of India cannot but think that if zeal, energy and judgment, similar to that shewn by Brigadier-General Tombs, be shewn by Officers Commanding Madras Troops, a somewhat similar result might be fairly anticipated."

It may be noted that in one portion of the arrangement, General Tombs' system of carrying out the dry earth method is needlessly costly, *i. e.* the use of pans of the same pattern as those for European troops; experience has shown that in a properly-constructed latrine, these are not wanted for natives.

But the experience attained is not a little remarkable. For seven thousand rupees he is able to build public latrines sufficient for the accommodation of a population of 56,000 people. In this calculation I have taken the cost of the large latrine, sufficient for two thousand people, at Rupees 250. The grand result is, that the special local taxation for conservancy purposes has produced an income (apparently collected without trouble,) not only sufficient for the maintenance of the scavenging establishment, but which has yielded a surplus, capable of paying a good interest on the money laid out in building the latrines, and to compensate for wear and tear of plant and establishment.

Nothing is said about the sale of manure, although in process of time, the revenue under this head ought to amount to no inconsiderable item.

Well may the Government of India remark, that if "zeal, energy, and judgment" similar to that shown by Brigadier General Tombs were a little more general on this side of India, "somewhat similar results might be fairly anticipated."

The Bengal Sanitary Commission, in its report for 1865, says of the dry earth conservancy, that "there is almost a complete concurrence of opinion" among the officers who have tried it in the tract of country "between Peshawur and Singapore," that its success *when properly managed*, "has been most remarkable."

Mr. Gover of the Military Male Asylum, Madras, (the only gentleman in Madras, who, of my own knowledge, has brought a cultivated intelligence to bear upon the practical application of the system) has reported, in the most unqualified terms, the complete success of the system in the extensive establishment over which he presides.

Not only has it been carried out without increase of cost, but an actual saving of about twenty rupees a month in conservancy establishment has been effected,

The Madras Sanitary Commission says that it is "impossi-"ble to suppose that similar measures could not be "followed by similar results in the army," and when in this Presidency we can get the wheels of official routine to turn a little faster, so as to carry us beyond the region of experiment, in the mud of which we have been sticking for the past three years, it is not unlikely that General Tombs' example may teach others in authority that the introduction of the dry earth system in our towns, cantonments, and villages, is not only practicable as regards the question of expense, but that it affords the only really feasible means of enabling Government to grapple with the difficulty of effecting any real sanitary improvement in the condition of the population generally. Although Captain Tulloch may still adhere to the maxim that there is "nothing like water" for the removal of sewage, this much can be said in proof of the advance made in the modern principles of conservancy, that there are other Engineers in India who, not having committed themselves to positive

opinions, are free to acknowledge the many advantages of the dry method, and to set themselves to work with a will to improve and simplify the means of reducing theory to practice. While I write, I have lying before me a scheme proposed by Mr. Bruce, the Municipal Engineer of Lucknow, for the cleansing of that large and thickly-populated town, in which he sets himself to the task of dealing with the excreta of the population in the only way that, in my opinion, it ever ought to be dealt with in India. This gentleman does not conjure up impossible difficulties. The details of his scheme may be open to criticism, and his estimates of the value of manure may be fixed too high, but there can be no doubt that he has grasped the spirit of sound conservancy principles, and that he designs seriously to apply them in practice.

The outline of his scheme, as given in the proceedings of the Bengal Sanitary Commission for December 1866, may not be destitute of interest at the present time, when public opinion is gradually coming round to the view that somewhat similar measures are suitable to the condition of Madras and its people.

"A scheme for a proper system of drainage conservancy in the city of Lucknow has been drawn up by Mr. Bruce, the Municipal Engineer. From his memorandum on this subject, it appears that from the elevated position of the town with reference to the River Goomtee, no natural difficulties have to be contended with. Were the present channels properly cleaned out, and all the obstructions which have gradually grown up removed, the whole city would be kept dry even in the heaviest rains. For drainage, therefore, Mr. Bruce recommends that all the main open nullahs should be opened out, by cleaning out all the filth which has accumulated in them, by pulling down and re-constructing the bridges that are of insufficient water-way, by removing such houses as have encroached on the nullahs and obstructed their channel, and by re-laying their beds and building falls wherever these may be required. As regards the great mass of the deep drains which run through the city, he would have saucer-drains in their place. Surveys and levels have already been completed to show how these recommendations can be carried out. With respect to conservancy, Mr. Bruce estimates that, taking the population at 2,00,000, there will be a daily quantity of 7,500 maunds of sewage, &c. to be removed. He obtains these figures by allowing one pound of soil and two pounds of sweepings per head. In order to remove this large quantity of refuse, he proposes to have a number of depôts within the city at which it should be collected. The soil and sweepings of private houses are at present removed by Mehters, who receive

remuneration according to the means of the classes by whom they are employed, their wages in many instances amounting to only a a few chupatties or seers of rice per mensem. Mr. Bruce proposes that these men, who are spoken of as amounting to from 1,000 to 1,500 in number, should be engaged by the Municipality and receive regular wages. One thousand paid Sweepers at Rs. 4 a month would, he believes, be fully equal to what is to be done, and this would fall as a tax of 3·84 pie on each inhabitant.

"At present only a small portion of the filth is removed outside the city. The practice is to throw it into the nearest nullah or other excavation, the only exception apparently being so much as is taken by the contractors for brick-makers and cultivators, which is estimated at not more than 1,500 maunds daily, and that only during eight months of the year. In the rains none is removed, except so much as is washed down the main outlets. As the most effectual and economical mode of removing the enormous mass of refuse daily, Mr. Bruce proposes tramways worked by ponies. To complete this system would require 22 miles of tramway, but if only the main lines leading from the depôts were laid down, the length would be considerably diminished. For the reception of the soil at each depôt, he proposes there should be 20 air-tight receptacles, of which, in order to provide a double set, 4,000 would in all be required. Every morning 2,000 of these vessels would be ready for removal, and would require 200 trucks containing 10 receptacles each. For the sweepings 200 extra trucks would be requisite, so that in all 400 would be required. Each pony would drag four trucks, or a weight of 4 tons. The total original outlay would be—

		Rs.
15 miles of tramway @ Rs. 16,000......	=	2,40,000
400 trucks @ Rs. 200........................	=	80,000
4,000 receptacles @ Rs 8.....................	=	32,000
Or a total of...		3,52,000

"As regards the final disposal of all the soil, &c., Mr. Bruce is of opinion that it might ultimately be sold; if it were to fetch Rs. 2 per 100 maunds, the result would be an income of Rs. 36,000 annually. The cost of the working establishment he estimates at Rs. 18,660 per annum, leaving a balance of Rs. 17,340.

"In order to cleanse the main drains which, however, are on no account to contain sewage, Mr. Bruce further proposes that a pumping engine should be erected. The cost would, he believes, be Rs. 1,00,000. By this means also a supply of water could be given to the inhabitants.

"Mr. Bruce's scheme is, no doubt, well worthy of consideration. The expenditure proposed is large, but the conservancy of an immense city like Lucknow, cannot be carried out without expense. At a comparative small outlay it might be experimentally tried in one quarter of the town."

Captain Tulloch in torturing an expression of mine to suit his own views, makes me say "adopt dry conservancy "and Madras will become a model of cleanliness for 2½ lacs "of Rupees." Now it is scarcely necessary to repeat here what I have said elsewhere, that I never wrote anything that would bear such construction, and that I never made, what Captain Tulloch calls, an "estimate" of the cost of applying the system to the town of Madras.

When I hinted at the possibility of cleaning Madras for less than half a million of pounds sterling, I suggested that it would be worth careful enquiry, whether for an expenditure of a twentieth part of the money it might not be possible to keep the town clean, especially of the most dangerous refuse, human excreta. The twentieth part of half a million of pounds is certainly two and a half lacs of rupees, and Captain Tulloch is entitled to any advantage which this fact may give, but when he converts a simple suggestion into a positive statement, and gives the latter the appearance of an actual quotation from my pamphlet, he wanders beyond the bounds of fair criticism, and lays himself open to the charge of deliberate misrepresentation of the passage in question. As it turns out, and as I have already shown, Captain Tulloch's "estimate" of the cost of applying the dry method of conservancy to the town, is not very different from my own. Both are no doubt vague and indicative only of moderate outlay. I suggest that the expense may be made a "mere trifle" in Municipal expenditure. Captain Tulloch admits that the cost of all essentials of the scheme "to the Muncipality would really be most trifling." The difference therefore is only that which may be imagined to exist between a "mere trifle" and a "most trifling" cost.

Captain Tulloch, or some other engineer who has given the subject careful attention, would be doing a good service to the Municipality by showing, on somewhat reliable data, the proportion of the town population for which public latrine accommodation is required—as also the most economical method of constructing the buildings and of removing from the town the substances which are most dangerous to the health

of the people. Surely in the latter part of the nineteenth century, a country cart and a pair of bullocks, moving at the rate of two and half miles an hour, and removing half a ton of refuse in each journey, cannot be the most economical procedure, when the daily refuse is estimated at 860 tons. Street railways or tramways have been advocated on other grounds, as likely to be remunerative in Madras.* By such means, or by completing the junction of the north and south canals, the town rubbish might certainly be more economically transported than it is at present, and one of the grave difficulties of establishing the dry method—that of disposing of the rubbish—would be made to disappear. The present mode of scavengering costs a good deal of money, and is by no means perfect; the refuse of a large number of the people is not removed at all by the conservancy establishment, but with all the admitted defects of the present system, and the worse than useless attempts at street drainage, there can be no doubt that the town of Madras is kept more free of fecal pollution, than are the towns and villages in the district, where not even the semblance of decency and method in conservancy is attempted.

It will be no doubt a matter of surprise to some people to hear that the town population is better protected from cholera than the country districts, yet this appears to be the case, and is just what might be expected, if we admit that the liability to cholera is increased by neglecting to dispose in a proper way of the excrementitious matters of the population. During 1866, when cholera prevailed in almost every part of Southern India, it is interesting to note that the incidence of the epidemic fell with greater severity upon the scattered inhabitants of the Madras district, than upon the crowded communities within the limits of the town. The

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* At the present time, when exertions are being made to obtain Parliamentary powers for the introduction of street railways into the metropolis, it is interesting to consider what has been done on the other side of the Atlantic in connection with the same movement. In the year 1863 a Commission was appointed by the Legislature of Massachussets to investigate the street railway system of that State. After hearing a large number of witnesses, the Commission reported, in January 1865, as follows:—'From the testimony before us, and from all we know or can learn in regard to street railways, we entertain no doubt they must be regarded as an indispensable necessity, the call for which will be likely to increase rather than diminish in the future; and that, if properly managed, they may be made remunerative at very low rates of fare.'—*Sunday Gazette.*

death registration reports for the Madras town and collectorate are as follows :—

	Assumed Population.	Deaths.	Cholera.
Town............	430,000	... 13,881	... 2,984
Collectorate.....	664,900	... 22,869	... 9,294

Proportion of deaths to population in the district 34·3 per thousand.

Do do from cholera .... 13·9 „
Proportion of deaths to population in the town. 32·2 „
Do do from cholera .... 6·9 „

Here then are important facts, which we shall do well to ponder over, in connection with public conservancy. The inhabitants of a town in which scavengering is carried out, after a fashion, but not so completely as is desirable, die at the rate of 6·9 per thousand during a Cholera epidemic

Note to line 5, page 242.

WE have been requested to state that the quantity of refuse to be removed daily from Madras is considerably overstated. We are not aware whence Mr. Cornish obtained his information, but we have been told on the authority of Colonel Denison, that the amount is 231 and not 860 tons.—ED. *M.Q.J.*

ready said as to the important question of temperature, I am afraid that British experience will not help us in solving the difficulty of disposing of our town refuse in India.

The physical conditions of the two countries differ so widely, that what may be regarded as a model system of drainage in the one country, may prove a complete failure in the other. But although I do not anticipate any advantage from a strict following of British models, I have not the least doubt but that Captain Tulloch might derive much valuable information, by visiting some of those countries, which, as regards temperature and climate, are more closely allied to India than to England. I have no records at hand to show how the people in New Orleans, San Francisco,

and other places in warm latitudes dispose of their sewage, but I think it quite within the bounds of possibility that an intelligent officer visiting the chief cities in America and Australia, would be able to pick up some valuable hints for guidance, in reference to the cleansing of Indian towns. In Australia, I have reason to know that the system of earth sewage is making considerable progress, and that its general application has been discussed by the Victorian Parliament. A Government "blue book," has been published in Melbourne bearing upon this question, though I regret to say I have been unable to procure a copy of it, so as to give any account of the conclusions come to. The following paragraph, however, from a late number of the *Melbourne Age,* will show what the local Board of Health thinks of the respective merits of "wet" and "dry" conservancy.

"The report of the Victorian Central Board of Health for 1865, has been placed before the Legislature. It deals mainly with those evils affecting the public safety which unfortunately still exist, and which may result in a national calamity if not checked by the adoption of a comprehensive public health act. The report deals at considerable length with the water-closet and cesspool question, advocating the substitution of earth closets as the only one adequate remedy for the abominations of the present system."

The progress made by our energetic Australian neighbours, while we in India have been only thinking and experimenting, is such as may well cause us to hide our heads with shame.

Every Newspaper from the colonies that reaches me, contains amongst its advertisments, some thing to the following effect.

EARTH CLOSETS.

DRAPER AND SON'S

Are the best and cheapest Self-acting Closets made.

From £3 and upwards.

Factory; 83 Bourke-street west, next St. Patrick's Hall.

Earth supplied and cleaned at moderate rate.

FRASER'S IMPROVED PATENT EARTH CLOSET

cannot be surpassed in Simplicity, Durability and Regularity of Action. The best and cheapest ever invented. Inspection invited at the factory, 174 Lonsdale-street east.

Earth supplied and closets cleaned for a trifling annual charge.

One firm, I see, notify that upwards of 400 of their "earth closets" have been sold in Melbourne during the past year; and the system would now appear to be commonly establish-

ed in that town. With the fact before us that a young and wealthy town like Melbourne, should be seriously considering the best means of carrying out a system of dry earth conservancy, we may surely well pause here and enquire whether a modification of the system is not better suited to the requirements of a tropical climate, than the water system, which so many otherwise well informed people, still maintain to be the one thing needful for the purification of our town.

As regards the experiments which have been made in this Presidency to introduce dry earth conservancy, it would be easy to record, and to account for, a long list of failures.

The Honorable Mr. Ellis, C.B., Sanitary Commissioner, in an able memorandum on the subject lately submitted to Government, sums up the whole question very clearly in the following words:—

"The absolute success of the dry earth system is evidenced by "the Male Military Orphan Asylum, where, under the careful super-"vision of the Principal, Mr. Gover, the new conservancy has "answered admirably, and with only a trifling increase of expense.

"Judged by this institution, it would be easy to report to the "Government of India that the system is an entire success. Judged "by the experiments in the Fort, it would be necessary to state that "the system is a failure." *(Dated 27th March 1867.)*

From this we may understand that failures, when they do occur, are not the result of faulty principles, but of errors or defects in the method of applying the principles. This I believe will be found to be the truth in every instance in which the earth system has failed to effect the object expected of it.

I cannot close this paper without briefly alluding to the progress already made in India, in the understanding of the principles of dry conservancy. When I wrote my pamphlet "On the Cleansing of Towns," I was not aware that Dr. Charles Hathaway had actually carried out in the Punjaub, the plan of separating the fluid and solid excretions, but such I have subsequently ascertained was an essential feature of the "dry system" which he so successfully introduced in all the jails of the province. I made the suggestion for separately collecting feces and urine in ignorance of what that officer had already successfully accomplished, and I made it with a special motive, viz., to diminish to the utmost the quantity of earth to be carted to and fro. Now the practical

difficulty in earth sewage is the cost of moving earth, and it follows that if the quantity can be reduced by one half or two-thirds, that the expenses of the system must be reduced very much in proportion. The Madras Sanitary Commission of 1864, considered the suggestion of mine in regard to separate collection to be unimportant, but it subsequently changed its mind, (1865) and devised a plan to secure effectual separation of fluids and solids. Now I regard this as an all-important question, and particularly in the management of public latrines, and I think that the experience already acquired in Bengal is conclusive in favour of the practice both on the score of efficiency and economy. Before the introduction of earth sewage, the system was clearly understood and practically followed in the Punjaub jails. During my late visit to Calcutta, I saw it in practical operation at the Alipore jail, an institution containing 1,500 prisoners, and where, thanks to the admirable management of my friend Dr. Faucus, not a trace of evil odour could be detected in the privies designed by him to effect the separation of the urine and feces. In Dr. Faucus' privy the arrangements are so simple, and yet so effective, that however stupid and obstinate the people may be, they cannot misuse it. In this establishment the urine is at once applied to grass land, generally diluted with water. It occasions no offence. The fecal refuse mixed with earth is covered up in trenches in the garden, and allowed to remain undisturbed for about two months, when the soil is turned over and cultivated. With regard to the economy in labour of such a separation, the following note, addressed to myself by a gentleman who had followed the instructions laid down in my pamphlet, will sufficiently testify :—

NELLORE, *April 19th*, 1865.

MY DEAR CORNISH,—I should before have communicated to you the result of the experiment I made in this jail, of the privy you recommend in your first pamphlet. But lately I have been so much pressed for time, and my Dressers' hands have been kept so full during the late epidemic which we have had, that it has been altogether out of my power to manage it earlier. And being about to leave the station, I must, before doing so, communicate to you the trial we have made here of the style of privy you propose.

I cannot more fully do so than by sending you a copy of letter I sent to Mr. Story, lately officer in charge here, in which I asked the extension of the principle throughout all the privies in the jail, cells, and hospital. The privy I made is the cleanest in the whole

prison, and perfectly free from all disagreeable odours. It is used only during the day, and is common to all the prisoners confined in the old jail, where sometimes the number detained reaches a very high figure. Complete separation of fluid from solid excreta is with ease effected; the nullahed floor invites the sitters to drop their urine there, and it is equally easy for those frequenting the privy to do the washing part of the operation, apart from where the solid excreta have fallen. Outside there is also a total absence of all noxious smells, and so cleanly can the place be kept, that there is no necessity for the objectionable flushing, which can only hasten decomposition of the feces, and besides wash out to the nullahs on each side what seems so perceptibly to contaminate the air around the jail, and it may be also in the hot weather, the wells of the prison. The economy of labour, further, strongly recommends the adoption of the principle, for when by the present system of mixing fluids and solids together, the gang of toties we have require to make five trips daily, a distance of two miles, to remove all the night soil of the jail, dropped in the thirty tubs, scarcely more than one trip, should your plan be adopted, need be made, and more time and more hands can be commanded for carrying out thorough cleanliness. The privies can all be kept perfectly dry, and being so, there is an entire absence of smell both inside and out. I have asked almost every one in the station to examine the one I made, and all have been equally astonished at the result, and satisfied with the completeness of the principle. You might have an opportunity of seeing Mr. Story at Madras before his departure by the next steamer, and he is able to bear out fully all I have said regarding it. If extended here, it will cost little or nothing. A ton and a half of asphalte, about seventy parahs of lime, and a few bandy loads of firewood, are all that will require the outlay of money, in addition to new buckets. Laterite stones can be cut by the prisoners, and I think the whole can be done for Rupees 500,—cheap enough surely for fifteen privies.

Yours truly,
HUNTER ADAM.

The Earth closets which have been already invented do not, so far as I am aware, make any provision for the separate collection of fluids and solids. This perhaps is not of so much importance in private houses, where they can be frequently cleaned, but in public latrines. I think the separation should be invariably attempted. There is no insuperable difficulty in the matter, if we adopt methods which leave nothing to the control of the people who frequent these places, and the labour of keeping the latrines clean would be very considerably diminished.

In my pamphlet (page 20), I suggested the use of earth for the absorption and dryage of urine as a temporary expedient only, and added, "that in a country where salt is "manufactured on a grand scale out of sea water, by simple "evaporation, I do not despair of seeing measures adopted "to concentrate urine for the farmers use, without the inter-"vention of any drying material."

From frequent consideration of this subject, I am inclined to think that the suggestion offers a practicable means of disposing of the fluid excreta in those parts of India, where the dryness of the atmosphere allows of rapid evaporation. The urine might be collected and retained in cisterns, sulphuric acid being added to fix the ammonia, as it became disengaged, and carbolic acid to retard decomposition. In fine weather the urine might be pumped into shallow evaporating basins, constructed of well rammed clay, and in shape like salt pans. The semi-solid matters left by evaporation might be rapidly dried, and converted into portable manure by mixing with them a very small quantity of highly dried clay in powder. The Sanitary conference of Constantinople, have already recommended in regard to the places of deposit of excreta, that manufactories of manure should be established in connection therewith. In these places I would endeavour to save as much as possible of the valuable constituents of urine, by the process I have just hinted at.

Then again by effecting a separation in the two excretions, it is quite possible for private establishments to do without the use of earth. The ashes from the cooking places would usually be ample in quantity for the drying and removal of fecal deposits, and in this way an enormous saving in carriage might be effected. As a manure the mixture of ashes and fecal matter, will always be more valuable than earth and fecal matter, in the shape of poudrette.

Lastly, there remains to be considered the great difference in the quality of soils, as regard their power of converting decaying organic matter into harmless mould. The experiments made by Dr. Faucus, of the Bengal Medical Service would seem to establish that the peculiar property which earth possesses in this respect, is due to the amount of organic matter, or *humus* already in the soil. This gentleman found, that pure clay, or "soorkie," (brick dust) did not possess anything like the absorbing or converting power, that was effected by soils

highly charged with organic matter. This result was unlooked for, but it showed that the Revd. Mr. Moule was quite right in asserting that earth might be used over and over again for the reception of fecal matter, and that its power of deodorization was in no degree lost by frequent use. The practical lesson from Dr. Faucus' experiments is, that the poudrette which has been once used, may, after thorough mixing and dryage, be stored for subsequent use, and with increased power as a deodorizer. By repeated usage only can the poudrette be made so valuable as a manure, that people will care to buy it and be at the expense of carting it away.

The too lavish use of earth is the one great mistake that is being made in India, in regard to the new system of conservancy. Every effort must be made to reduce the quantity of soil, and to make a supply serve for more than one occasion. Let it be always remembered that healthy feces contain about 75 per cent. of water—that supposing soil and fresh feces to be mixed together in equal proportions, the quantity of the latter, when dry, will be only as one to four of the former. By using three or five pounds of earth for each person, the proportion of the fertilizing agent becomes so small that no great advantage can be expected from using poudrette of this strength for manure. The object should be, not so much the rapid destruction of bad odour, which is effected by using large quantities of earth, as the slow conversion of fecal matter into a rich fertilizing mould. In a town like Madras there should be at least a dozen manure factories, in which the excreta of the people might be scientifically dealt with, preparatory to its sale to the cultivators. If this thing is worth doing at all, it is worth doing well. Mechanical skill and the adaptation of scientific principles to the object in view, will alone help us in dealing with the difficulties of the dry system.

Is it too much to ask of our Engineers and Mechanicians that they will devise an economical system of collection and removal of town refuse, and of Sanitarians that they will agree upon and lay down the principles that should be adhered to, in carrying out a measure so important in regard to public health?

ART. XIII.—*Note on the use of the Compound Tincture of Benzoin in Chronic Dysentery and in Mucous Diarrhœa.* By W. N. CHIPPERFIELD, Surgeon, Acting Physician, General Hospital, Madras.

(Communicated by the Inspector-General, Indian Medical Department.)

HAVING had considerable experience during the last ten years in the use of the *Compound Tincture of Benzoin* in certain affections of the mucous membrane of the intestines, I am anxious to call attention to the success attendant upon the administration of this remedy in suitable cases. In doing so, I am quite aware that I am not proposing anything like an original application of this medicine, but rather a revival of the use of the once much celebrated *Friar's Balsam.* I believe that this preparation has almost entirely fallen into disuse as an internal remedy, except in cases of chronic bronchitis with profuse mucopurulent expectoration, in which cases it is generally held of a value second, perhaps, to that of Ammoniacum, Venice Turpentine, Copaiba, and the like.

In Vol. IX of this Journal I published some cases which sufficiently indicate the forms and stages of *Acute Dysentery* in which I have found the Compound Tincture of Benzoin useful, and the mode in which it is administered ; but the cases alluded to give but slight indications of its value in those cases, in which, as it appears to me, its use is particularly to be advocated.

In sthenic acute dysentery large doses of Ipecacuan, with suitable topical applications, generally effect a complete cure, but in complicated cases the action of this valuable drug requires to be supplemented by other remedies. In sub-acute, asthenic and scorbutic cases, though a few large doses of Ipecacuan may prove of great benefit, yet alone they will not effect a cure ; and in cases of long standing chronic dysentery, the use of Ipecacuan is absolutely confined to those instances in which some acute or sub-acute action becomes implanted upon the existing chronic disease.

I may as well at once mention the forms of mucous membrane affection in which I use the Benzoin ; but it must be understood that I am not writing upon the general treat-

ment of dysentery, nor do I intend to enter at all upon the pathology of the affections for the treatment of which I advocate the use of the compound Benzoin tincture; this paper is far less pretentious, being simply a note on the employment of this remedy. I shall content myself, therefore, with pointing out the more obvious objective symptoms, and especially the appearance of the evacuations, which guide me in exhibiting the Benzoin, and the mode of application which considerable experience has led me to adopt.

1. In sub-acute and asthenic cases, when all signs of activity have passed off; when febrile action, if ever present, has entirely ceased; when there is no longer anything like hæmorrhage from the bowel, but the blood that is passed is very small in quantity and mixed with a considerable amount of glairy or opaque mucoid exudation, or perhaps with a small amount of pus; and when the discharges, which may be small and frequent and attended by some tenesmus, consist chiefly of semi-fluid feculence mixed with the materials just mentioned, or with broken-up shreddy masses of ulcerated mucous tissue.

2. In cases of chronic dysentery, when the stools consist of frothy feculent matter of a pasty consistence, containing much air, and of various shades of yellow, green and brown, and intimately mixed up with a quantity of mucoid exudation; sometimes exhibiting separate small masses of opaque or transparent glairy slimy substance, streaked with blood; sometimes containing a little purulent matter. If they are copious, there may be only three or four such stools passed in the twenty-four hours; but if they are scanty, they may be numerous and cause great distress to the patient from loss of rest, and from irritating the anus and lower part of the rectum. In cases of long continuance the patient endeavours to restrain the evacuations, and when he is off his guard they will pass suddenly and with some force, causing much discomfort.

3. In simple mucous diarrhœa (catarrh of the intestinal membrane), with or without febrility, when there are griping pains in the abdomen with a sensation of tearing when at stool; the evacuations frequent or infrequent, but of very varying character, generally semi-consistent, sizey, of ochry brown colour; sometimes preceded, sometimes followed, by a ball of glairy mucus as large as a pigeon's egg; often consisting of small scybalous masses, each mass enve-

loped by a layer of clear mucus; never containing any blood.

4. In somewhat rare cases:—when a patient, after having suffered for some time from chronic diarrhœa, is affected with more or less constipation, the stools being solid, of natural form or somewhat scybalous, and accompanied with, or followed by, shrivelled, semi-transparent, membrane-like masses, looking like a congeries of ruptured thin cysts (evidently casts of the crypts of the colon).

5. In cases of the chronic form of infantile inflammatory diarrhœa, the evacuations always containing mucus, sometimes a little blood, with small masses of precipitated undigested casein, and a quantity of sizey matter of various shades of green; the odour very various, sometimes feculent, but more often sour or faintly acid. This diarrhœa is sometimes the result of reflex irritation during the pressure of a rising tooth against the dentinal membrane and gum, when lancing the gum will give relief; but very frequently it occurs during the final calcification of the dental pulp long before there is any pressure from the tooth, and then, as Dr. West says, " it would be a cruel and useless piece of empiricism to subject the child to the distress of the operation," although it is often done. But the flux may occur before dentition takes place; and, again, it may happen after the completion of the first dentition; in other words, it may be quite independent of irritation from teething.

Under the circumstances outlined above, I have found very great relief from the internal administration of the compound tincture of Benzoin, either by mouth or rectum. The formulæ I generally use, are the following:—

FOR ADULTS.

℞. Pulvis Acaciæ, gr. 30.
Tinct. Benzoin. Comp. f. ʒi.—f. ʒii.
„ Opii ♏xx.—♏xl.
Aquæ fontanæ vel Carui. ad f. ℥vi.—Misce fiat mistura.

A fourth part every four hours.

FOR INFANTS AND CHILDREN.

℞. Tinct. Benzoini Comp. f. ʒi.
Vini Ipecacuanhæ, f. ʒi.
Syrupi, f. ℥ss.
Aquæ font. ad. ℥iiss.—Misce fiat mistura.

From one to three teaspoonfuls every two, three or four hours.

Should the stools be frequent, very relaxed, but semi-feculent, from f. ʒss. to f. ʒi. of the Compound Tincture of Kino may be added to each dose for adults, and a proportionate quantity for children, or the Infusion of Cusparia or Decoction of Hematoxylon may be used as a vehicle instead of water. If opium be contraindicated, it may be omitted, or if necessary, a proper quantity may be added to the mixture for children.

The exhibition of Benzoin does not in the least interfere with the giving of other remedies when deemed necessary. Thus in asthenic and scorbutic cases, quinine (Liquor Quinæ Amorphous) may be added in any needed quantity to the mixture; or one or two doses may be replaced by a draught containing from ♏xx. to ♏xl. of Liquor Ferri Pernitratis. Lime juice or Bael sherbet may be given with the medicine.

When laxatives are needed to ensure the emptying of the bowel, castor oil, or rhubarb, or jalap may be given in the early morning, the benzoin being continued through the day. From half a grain to a grain of podophyllin, with a grain of opium or half a grain of extract of belladonna, given at bed-time is an adjunct to the benzoin treatment, which I often use with advantage when the liver is inactive. This dose may be given for three or four consecutive nights, or it may only be required once or twice a week. Absence of bile from the stools, an icteric tint of the conjuctiva and the presence of bile pigment in the urine are guides to the exhibition of podophyllin, provided there are no signs of obstruction. The Benzoin mixture may also be alternated with the mineral acids when their use is indicated. In the forms of dysentery, comprised under headings 1 and 2, and in infantile diarrhœa the Benzoin may be usefully administered by rectum as well as by mouth.

The following is a formula for an enema :—

℞. Pulv. Acaciæ, gr. 30.
Tinct. Benzoini Comp. f. ʒii.—ʒiii.
„ Opii, ♏xx.
Aquæ tepidæ, f. ℥iv.—Misce.

℥ss. for an infant, and from half to the whole quantity

for an adult, to be injected whilst milk warm once, twice, or thrice a day.

An adult will seldom have any difficulty in retaining this injection for some hours, and a child may be made to retain half an ounce by the nurse sitting by the side of the cot and steadily pressing a folded napkin against the anus, whilst the little patient's attention is attracted by pictures or toys.

Should much shreddy mucous tissue, with or without blood appear in the stools, from 5 to 10 grains of alum, or of sulphate of zinc, may be added to the above enema; and if subacute symptoms supervene, one or two ounces of Infusion of Ipecacuan (Ipecacuan bruised, gr. xxx. to xc. Boiling Water 2 oz.) may be used instead of the water. Great benefit will often result from washing out the bowels (an hour or two before giving the above injection) with a couple of pints of warm water or an equal quantity of nearly cold water, to which half an ounce of soap liniment has been added.

I have referred to such works on Materia Medica as are at my disposal, and I find that the compound tincture of benzoin is spoken of only as a stimulant expectorant in chronic bronchitis, and as formerly used as a stimulant external application. I believe its effects upon the mucous membrane of the bowels are in a great measure of a stimulant evacuant character. It clears away the deranged secretion; at first it gently stimulates the membrane, and secondarily is sedative in its action. And when ulceration has occurred, it promotes healthy granulation.

It is probably due to the endeavours of the modern surgeon to obtain the healing of wounds by immediate union or by the first intention, that Friar's Balsam has fallen into almost complete disuse, if not disrepute, as an application to wounds which must necessarily heal by the second intention. I think the disrepute is undeserved, and although I would not revert to the practice indiscriminately, I certainly would do so in suitable cases.

It may be objected that as the compound tincture of benzoin contains aloes, it is scarcely a remedy likely to be beneficial where there is any irritation of the large intestine and especially of the rectum. But the quantity of aloes it contains is very small, about one grain in one drachm; and

whatever theoretical objections there may be, a large experience warrants me in asserting that practically none exist.

I have looked through the literature of Dysentery and Diarrhœa as exemplified in the writings of Sydenham, Annesley, Twining, Geddes, Mortimer, Mason Good, John Brown, Copland, Trousseau, Martin, Hooper, Watson, Aitken, Maclean, Tanner, Guy and Harley, but I find no notice of the use of the compound tincture of benzoin, unless such is included in a general reference by Brown and Copland to balsamic medicines in chronic dysentery. Nevertheless, I have a recollection of having seen a printed advocacy of the use of this remedy in chronic dysentery, though I have no note of reference to the authority. Therefore I repeat that I claim no originality in recommending this preparation in the cases I have mentioned; and I am so anxious to avoid any appearance of empiricism or routinism, that I must also repeat that I do not advocate the use of the compound tincture of benzoin to the exclusion of the ordinary remedies for dysentery and diarrhœa and for the pathological conditions with which they may be associated, but simply as an admirable addendum to such remedies in certain phases and stages of these diseases. And I feel confident that those who may be induced to try the remedy will soon be convinced that, as regards the conditions I have pointed out, they have in the compound tincture of benzoin a valuable addition to their Therapia.

ART. XIV.—*Report on two epidemics of Cholera in the Madras Penitentiary, during the year* 1866. By Surgeon W. H. HARRIS, M.D., in Medical charge.

(Communicated by the Inspector-General, Indian Medical Department.)

DURING the past year there have been three separate visitations of Cholera at the Madras Penitentiary, two of which have been reported as "epidemic." On the first of these occasions the disease appeared on the 23rd of July and continued until the 21st August. During this period there were 26 admissions and 14 deaths, the ratio of deaths to admissions being 53·8 per cent. The second outbreak took place on the 8th October and continued until the 18th idem. There were, on this occasion, only 10 admissions and 3 deaths, the ratio of deaths to admissions being 30 per cent. At the third visitation of the disease on the 9th and 10th November, only two cases were admitted and both died. In all, 38 admissions and 19 deaths, equal to 50 per cent.

In addition to the above, there have been 13 cases of Choleraic Diarrhœa admitted and 3 deaths, or 23 per cent. Some of these, if not the majority, might have been returned as Cholera; as they differed from true cholera only in the degree of collapse or in the period of its development. In all, the stools were "serous," and presented the characteristic rice-water appearance. Had these cases been all included in the Returns as cholera, the ratio of deaths to admissions would have been 43·5 per cent.

In order to illustrate clearly the mode of origin and progress of the epidemic within the precincts of the Penitentiary, it is necessary to enter somewhat into detail in regard to its construction.

The inclosure is situated on the north or left bank of the Cooum river, near the junction with it of Cochrane's canal. Chintadrepettah is on the south, on the opposite bank, and New Town lies a short distance away on the opposite side of the main street, on the west. The north faces towards the General Hospital and the People's Park, there being an open space between; and the east has also an open space, and the termination of Cochrane's canal between it and the Roman Catholic and St. Mary's Cemeteries. Cholera was rife in the two above mentioned suburbs, Chintadrepettah

and New Town, for more than a month before the first outbreak in the Jail; and as they both lie in the direction of the prevailing wind, during the south-west monsoon, it is not a matter of surprise that the disease ultimately found its way within the walls, but rather that it was kept at bay so long. The Jail premises are surrounded by two high walls, the outer 20 feet and the inner 12 feet high. The various yards in which the prisoners are lodged are bounded by the inner wall on the north side of the enclosure; they are ranged parallel to each other and separated by the buildings forming the dormitories, or by a high partition wall. These yards are narrow and confined, and are well calculated to exclude the breeze and prevailing winds, and they afford very inadequate space for the number of prisoners lodged in them. A portion of each yard, close to the inner wall of the Jail enclosure, is cut off by a dividing wall, and contains a well and two small buildings, probably originally intended as latrines, but now used in most yards, only as day rooms, in which the prisoners eat their meals. In the European Juvenile and Female wards, one of them is still used as a latrine.

These yards from east to west are occupied by the undermentioned classes of prisoners :—

No. 1. Females.
No. 2. Juveniles.
Nos. 3, 4 and 5. Police Magistrates prisoners sentenced to 6 months and under.
No. 6. High Court prisoners.
No. 7. Europeans.
No. 8. Sheriff's prisoners.

Nos. 5, 6, 7 and 8 have upper storeys. The Sheriff's ward is perfectly distinct from the rest of the Jail, and is subdivided for the accommodation of Europeans and Natives (male and female) committed for trial, and it contains separate cook-rooms and latrines for their use, in order that on the score of discipline, they may not be brought into contact with convicted prisoners in any way. The hospital is between the walls on the extreme east side. In the south-west corner of the Jail enclosure is placed a large latrine, which is used by all the prisoners except Females, Juveniles, Europeans, and those in the Sheriff's yard.

The Police prisoners in Nos. 3, 4, and 5, go out to work daily, in various parts of Madras, from 8 A. M. to 5 P. M. None of the other prisoners ever leave the premises during their sentences, but those who are lodged in the Sheriff's ward have to attend the Police Courts, while under examination, and the High Court, during the Sessions, when committed for trial.

The first prisoner attacked with Cholera was a European in No.7 ward on the 23rd July. He had been confined nine days only. Europeans have little or no communication with the other prisoners, and they use a separate latrine in their own yard. Returning from leave on the morning of this man's death, after only 12 hours illness, I proceeded at once to inspect the yard, and found the latrine in a very objectionable state. Until this time the wet system of conservancy had been in operation throughout the Jail, and from its always having been considered eminently successful as far as wet conservancy can be made, and the latrines as free from smell, as a rule, as the free use of water and coal tar could make them, there seemed no great necessity to interfere with existing arrangements, until the efficacy of the dry earth system had been fully tested. I now, however, strongly urged the immediate introduction of the dry earth conservancy in the small latrines, in the inclosed yards, and my recommendation was complied with the same day. There has not been another case of cholera among the Europeans.

Number 6 furnished the next case on the 24th July; there were also two admissions from this ward on the 4th August.

Female ward.—One case on the 25th July, and one on the 20th August.

Numbers 3, 4 and 5 (Police Magistrates prisoners) with whom a few convicts from the Straits had been lodged for want of room elsewhere (but in a separate cell in upper storey of No. 5). First case a police prisoner on the 30th July, next a Malay convict on the 4th August; and then a police prisoner from No. 4, only a very short time in Jail, and another Malay were seized on the 6th. All the remaining cases occurred among the police prisoners in Nos. 3, 4, and 5, with the exception of two men attacked while sick in hospital, and one admission from the Sheriff's ward on the 13th of a man still under examination by the Magistrate.

The following table will shew the admissions from the several wards, and the dates, more clearly :—

Date.	Sheriff's Ward.	European, No. 7.	High Court, No. 6.	Malay and Police, No. 5.	Police, No. 4.	Police, No. 3.	Female, No. 1.	Hospital.	Total.
July 23rd.........	...	1	...	...	...	...	...	...	1
„ 24th	...	...	1	...	...	...	...	...	1
„ 25th.........	...	...	...	...	...	...	1	...	1
„ 30th.........	...	...	1	...	...	...	...	..	1
August 4th......	...	...	2	1	...	...	...	...	3
„ 6th......	...	...	...	1	1	...	...	...	2
„ 8th......	...	...	...	...	...	...	...	1	1
„ 9th......	...	...	...	...	...	...	...	*1	1
„ 11th......	...	...	...	1	...	...	...	...	1
„ 13th.	1	...	...	...	...	...	...	...	1
„ 14th......	...	...	...	1	...	...	...	...	1
„ 16th......	...	...	...	...	1	...	...	...	1
„ 17th	...	...	...	...	...	1	...	...	1
„ 18th......	..	...	...	1	2	1	...	...	4
„ 20th......	...	...	...	1	1	...	1	1	4
„ 21st......	...	...	...	2	...	...	...	...	2
Total...	1	1	4	8	5	2	2	3	26

It therefore appeared as if Cholera persisted in consequence of the exposure of the police prisoners to influences without the Jail, and that no local cause existed within the building. During the above period disinfectants were freely used in all the dormitories, but, on the admissions being so numerous on the 20th and 21st, all the police prisoners were put under canvas, and Nos. 3, 4 and 5 wards closed for a time and fumigated. Tents were pitched and occupied on the night of the 21st, when a heavy storm of wind and rain blew some of them down, and the men had to take refuge in the rope-shed ; 0·8 inch of rain fell between 2 A. M. and 9 A. M., and upwards of an inch during the following night. Next day the tents were pitched under cover in the rope-shed, and Cholera ceased for nearly two months.

* Re-admission.

Whether the sudden cessation of the epidemic should be referred to the evacuation of the wards, or to the storm by which the electrical equilibrium of the atmosphere was restored, it is difficult to say, but it is remarkable, nevertheless, that the epidemic ceased entirely from that day. The greatest care had been taken to prevent the possibility of the disease being engendered or fostered by any local condition. The sanitary conditions of the infected wards was perfect. They were empty during the day; there was no latrine in these wards; they were not overcrowded; and still the epidemic was increasing in severity and almost entirely confined to one class of prisoners, who were located in adjoining wards. Corresponding with the arrest of the epidemic within the Jail, there was a considerable diminution of it, among the population generally for some time, and, were it not for the subsequent history of the year, I should have felt conviction that the prisoners were infected during the work-hours outside.

Second Epidemic.—In consequence of the disturbances on account of the scarcity of grain and the high prices which prevailed, an unusually large number of prisoners were arrested and committed for trial during September. On my return from short leave in the end of that month, finding the Sheriff's ward very over-crowded, I mentioned the fact to the officer in charge of the Jail, and suggested the advisability of transferring a portion of the prisoners elsewhere, as otherwise another outbreak of Cholera, I thought, might be daily looked for, the disease having continued among the population generally up to that time.

The difficulty of guarding the prisoners, from want of a sufficient reserve of Police, and other considerations, I understood, were the reasons for the recommendations not being attended to, and the consequence was, as predicted, another outbreak of Cholera.

The first case was admitted from the Sheriff's ward on the 8th October. The prisoners in this ward being in the custody of the Sheriff instead of the Commissioner of Police, are kept perfectly distinct from all the other prisoners; and, as before mentioned, there are separate latrines and other offices for their exclusive use. The latrine for the male prisoners is fitted with 6 seats, and is sufficiently commodious for the ordinary number of prisoners waiting trial, who seldom exceed 40; but, at the time here referred to, there

were about 180, and the state of the latrine could not well be otherwise than most objectionable, consequent upon being constantly used by so many individuals. A temporary latrine in one corner of the ward, which had been suggested some days before, was now ordered to be constructed, and the following day, when another prisoner in this ward was seized with Cholera, the overcrowding was relieved by transferring half the prisoners into one of the other wards (No. 5) which had been cleared for their reception. The accommodation in the Sheriff's ward, allowing 500 cubic feet of space to each prisoner is only sufficient for 90 persons, but there are spacious verandahs besides, and as these were all fully occupied at night, the overcrowding in the sleeping rooms was relieved to some extent, and it may fairly be assumed, I think, that the disease, in this instance, originated in the latrine.

On the 12th two fresh cases were admitted from the Sheriff's ward and one from the female ward, and on the 13th two more from the Sheriff's ward, another from the female ward, and one from No. 6. On this date the remaining half of the Sheriff's prisoners were removed into No. 4, and the ward entirely evacuated, fumigated and shut up.

The type of the disease was much milder than in the preceding epidemic. Two cases of Choleraic Diarrhœa had already been admitted, and five others came under treatment between the 13th and 17th,—they all recovered; and on the 18th one more case of Cholera from the Sheriff's prisoners in No. 4 ward, which was fatal. The epidemic was then entirely arrested.

Another storm and very heavy downpour of rain occurred on the night of the 13th, and coincidently with it and with the evacuation of the infected ward, as in the first epidemic, the disease was almost entirely checked, there having been only one admission from Cholera subsequently, namely, on the 18th. 4·5 inches of rain fell between the 13th and 18th; there had been none for five days before. Hence the question again arises, to which of the two should be ascribed the elimination of the pestilence—the restoration of the electrical equilibrium, or the withdrawal of the prisoners from the infected ward? It is partly answered, I think, in the subsequent history.

On the 4th, 6th, and 7th November, three cases of Choleraic

Diarrhœa were admitted from the High Court prisoners in Transportation ward, and on the 9th and 10th, two cases of Cholera from the same class of prisoners in No. 6 ward. This ward was then immediately vacated on the 11th, and the disease completely arrested before it had assumed the proportions of an epidemic, with the exception of one case of Diarrhœa which occurred on the following day. On this occasion there was no perceptible change in the atmosphere, and the measures which were adopted were effective, alone.

From these foregoing facts, the good effect of moving bodies of men, from their locale, when contaminated with Cholera miasm, is well illustrated, and they serve to give force and promise to the precautions, which are now almost universally admitted as being necessary, in case of an outbreak of Cholera, if adopted in time. Considering that prophylactic means are almost if not the only ones we possess, on which dependence can be placed for reducing the mortality from this cause, in order that the greatest advantage may be derived from them, they should be put in force, as early as, possible, before the disease has assumed epidemic proportions and gained a firm footing in the place.

Few years pass without the occurrence of epidemic Cholera within the walls of the Penitentiary, in consequence, no doubt, of its position, and not unfrequently (as during the past year) it assumes formidable proportions. When the transfer of some of the prisoners was proposed, to relieve the over-crowding, the difficulty of guarding them seemed to be the chief obstacle and this had to be considered more than the grounds on which the recommendation had been made. It would be very desirable to keep a sufficient number of tents always at hand for occasions of this kind, and also a sufficient reserve of Police for the extra duty of guarding the prisoners when under canvas.

With respect to treatment, my experience accords with that of most others. On no simple plan can any reliance be placed. The remedies which appear to afford relief in certain cases are without the slightest effect in others, and but too often it has been the practice to give the palm to the method which proved successful last. Small doses of Calomel and opium (grain i. of the former with grain ¼ of the latter) every hour with minims v. to minims x. of Chloroform, stimulants, and nourishment at frequent intervals

have been my chief remedies; but I have also tried various others. Taking care not to prescribe anything in such large doses, that, if absorbed, they could do harm, I have continued treatment of some kind throughout the stage of collapse, in the hope of rousing the patient, in the same way as I would attempt to do so in collapse from any other cause; but I have varied the medicine in most cases after a trial from four to six doses, when, if there were no improvement, another medicine was substituted for it. In many instances recovery has taken place after three or four different remedies had been employed; while in some others the steady downward tendency to a fatal issue has not been checked by any of the means employed.

The following table exhibits most of the remedies employed and the final result:—

	Admitted.	Died.
Lead, Camphor, &c.	3	2
Turpentine mixture (Mudge's)	8	4
Condy's fluid	13	7
Mustard and Ipecacuan emetics, &c.	11	6
Salt with Liq. Sodæ Chlorinatæ as an emetic followed by saline drinks, &c.	14	5
Carbolic Acid	4	2
Calomel and Opium, with Chloroform and Stimulants	30	15
Small bleedings, 2 to 4 oz.	6	4
Strong Turpentine mixture (Frazer's)	4	0

Formula :—

℞. Olei Terebinthinæ, ℥iss.
Creosote, ♏ xx.
Tinct. Lavandulæ Co., ʒii.
—— Capscici, ʒiss.
Essentii Cinnamoni, ♏xviii.—Mix.

Dose ℥ss. to ℥i. statim et repeat dosibus ʒii. pro re nata.

Out of six cases in which santonine was prescribed after the presence of intestinal worms had been indicated, there were two deaths.

Dry cupping, with hot fomentations of the loins and diuretics, was employed often with apparent effect in restoring the urinary secretion in those cases in which vomiting and purging had ceased and collapsed persisted.

With regard to peculiar symptoms, in 15 cases, or almost

40 per cent., either vomiting of undigested food taken hours previously (in one instance two days) or the presence of lumbrici was noticed. From this fact it may not be unreasonable to infer that the proximate cause of cholera is, in many instances, due to intestinal irritation. Many other facts may be mentioned in support of this view; for instance, cholera is known frequently to be developed after neglected diarrhœa, but it is not often possible to adduce evidence of this kind in the case of prisoners, as by admitting it, they would confess to having neglected the order to report sick immediately looseness began. It is not improbable that the rationale of the action of a full opiate in an impending attack of Cholera is explained by its effect in allaying intestinal irritation, more than to its astringent property, and as opium can neither eliminate nor neutralize the cholera poison, it is difficult to account for its action in any other way. If it be assumed that the disease consists essentially of a specific poison circulating in the blood, it may be that its peculiar influence is chiefly felt by the digestive system, and that if its elimination by the intestines is prevented by an opiate, it may pass out of the system by the other excretory organs without giving rise to constitutional disturbance.

In four cases the evacuations were observed to become at first pinkish, and gradually more and more grumous in character, evidently containing altered blood: of these, three died.

Head symptoms supervened in four cases (including one of those referred to in the preceding paragraph); first the conjunctiva became very slighty injected, then the patient grew drowsy or listless and apathetic, semi-conscious, capable of being roused and of answering questions, slowly at first, but afterwards almost insensible and unable to articulate. Then food and medicine would be refused, conjunctiva more and more injected, and the motions passed involuntarily. In some the temperature was moderate, in others low, and pulse weak and slow—all indicating nervous depression and exhaustion, with perhaps cerebral congestion. They were all fatal.

Art. XV.—*Report on the Cases of Asiatic Cholera treated at the General Hospital, Madras, during the second outbreak in* 1866. By Surgeon W. N. Chipperfield, Acting Physician, General Hospital.

(Communicated by the Inspector General, Indian Medical Department.)

On the 20th November 1866, after an interval of three weeks from the date of admission of the last of the 114 cases of Cholera included in my previous report, the disease again commenced to afford admissions into Hospital.

A reference to Mr. Ellis' Mortuary Report for the fourth quarter of 1866, will show that throughout Madras there was a rapid decline in the deaths from Cholera (from 71 to 10) during the fifth, sixth and seventh weeks of the quarter. Ten deaths also occurred in the eighth week, and in the remaining five weeks a rise occurred until the deaths amounted to 88 in the week ending December 28th.

Meteorology. There is nothing in the recorded meteorological observations which would indicate any connexion between either the decline or the rise in the number of deaths from Cholera and any atmospheric or telluric influences. The *Barometer* slightly rose previous to the decline, and continued to rise slightly during the rise in the number of deaths. The *Temperature* fell one degree at the time of the decline, and continued to fall with slight fluctuations during the rest of the quarter. The *wind* blew from the north-east from the period of the decline to the end of the year. Its *velocity* fell just before the decline, and during the rise it very much increased, and continued high till the end of the quarter. Heavy *rain* fell in the week preceding the decline, and a heavier fall occurred in the week preceding the rise in the number of deaths. The per-centage of *humidity* fell slightly below the average at the time of the decline of the disease, and rose slightly above the average when the increase in the number of cases occurred, and fluctuated a little during the continuance of the outbreak.

The following table exhibits the date of admission, the sex, age, duration of disease, result, state on admission, and treatment of each of the 62 cases admitted during the outbreak.

TABLE I. *exhibiting particulars of* 62 *cases of Asiatic Cholera treated in the General Hospital, from November* 20*th*, 1866 *to March* 3*rd*, 1867, *during which time the disease prevailed epidemically.*

EUROPEANS.

No. of Case.	Date of admission.	Sex. M.	Sex. F.	Age. Yrs.	Duration of Disease from commencement to termination.	Time in Hospital.	Results. Recovered.	Results. Died.	Condition on admission; concomitant symptoms.	Treatment.
23	1866. Dec. 18	1	...	43	2 days	33½ hours	...	1	Deeply collapsed, severe cramps, great distress, bloody stools. Delirium.	Saline Emetic and draughts, hot stimulants. Cupping to loins.
34	„ 30	1	...	25	Unknown	8½ „	...	1	Picked up by Police with only a flannel shirt on—Deeply collapsed, copious bloody stools.	Food and stimulants.
38	1867. Jan. 2	1	...	30	24 hours	16½ „	...	1	Deeply collapsed, severe cramps—great distress—head symptoms.	Chlorodyne at home. Saline Emetic and draughts, hot stimulants. Blisters. Dry cupping, Quinine.
52	Feb. 5	1	...	55	28 hours	17 „	...	1	Collapsed, severe cramps, Dyspnœa, much blood in stools.	Saline Emetic and draughts, Quinine and Stimulants.
		4	...				...	4		

EURASIANS.

1	1866. Nov. 20	..	1	29	8 days	8 days	1	..	Partially collapsed. Cramps. The menses appeared on recovery, having been absent 4 months.	Broths, Soda and Chloroform.
2	„ 25	1	...	16	9 „	7 „	1	...	Partially collapsed. Vomited round worms.	The saline draughts. Hot stimulants.
7	Dec. 2	...	1	6½	18¼ hours	11¼ hours	...	1	Collapsed. Cramps, no rallying.	The saline draughts, and hot brandy and water.
8	„ 7	1	...	19	13½ days	13 days	1	...	Partially collapsed. Cramps. Uræmia. Vomited worms.	Saline and Chloroform. Friction and heat.
35	1867. Jan. 1	...	1	9	6 „	5 „	1	...	Not collapsed, but very feeble.	Chlorodyne at home, salines, hot stimulants, Blister. Pot. Chlor. and Sp. Ether. Nitros. Purgatives, Enemata.
40	„ 4	1	...	15	7 „	6 „	1	...	Partially collapsed. Great thirst. Passed worms.	Saline Emetic and draughts, Santonine.
41	„ 4	1	...	19	32 „	32 „	1	...	Deeply collapsed. Violent cramps. Coma.	Do. Blisters, hot stimulants, Ether & Am., Enemata.
45	„ 8	1	...	24	13½ „	13 „	1	...	Partially collapsed. Severe cramps.	Saline Emetic and draughts. Pot. Chlor.
50	„ 20	1	...	30	10 hours	5½ hours	...	1	Do. do. do. Bloody stools.	Acids and opium. Saline draughts with Chloroform, hot stimulants.
		6	3				7	2		

NATIVES.

3	Nov. 28	...	1	30	27 hours	16½ hours	...	1	Deeply collapsed, cramps, jactitation, dyspnœa, no rallying.	Saline emetic and draughts, Hot stimulants.
4	Dec. 2	...	1	8	11½ days	11 days	1	...	Deeply collapsed, vomited worms, Uræmia.	Saline and chloroform, blisters, Pot. Chlor.
5	„ 2	...	1	2	19½ „	19 „	1	...	Deeply coll. Comatose for 36 hours.	Do. do. Hot stimulant.
6	„ 2	1	...	19	14¾ hours	1 hour	..	1	Do. dyspnœa.	Saline emetic, Heat, sinapisms to chest.

Table I.—Continued.

NATIVES.

No. of Case.	Date of admission.	Sex. M.	Sex. F.	Age. Yrs.	Duration of Disease from commencement to termination.	Time in Hospital.	Results. Recovered.	Results. Died.	Condition on admission; concomitant symptoms.	Treatment.
	1867.									
9	Dec. 8	...	1	40	5 days	3¾ days	...	1	Collapsed. Severe cramps, dyspnœa, Uræmia.	Emetic and saline draughts, Hot stimulants, Nitric Acid and Chloroform.
10	„ 8	1	...	46	4 „	4 „	1	...	Collapsed, no cramps.	Saline emetic and draughts.
11	„ 9	..	1	12	15 „	14 „	1	...	Collapsed, passed grumous stools.	Do, do. Hot stimulants.
12	„ 12	1	...	30	8½ „	8 „	1	...	Partially coll. vomited worms, Cramps	Do. do. do.
13	„ 12	...	1	25	4½ „	31 hours	...	1	Maniacal, collapsed. Fell into coma.	Do. do. do. blisters.
14	„ 13	...	1	25	9½ „	9 days	1	...	Collapsed, cramps.	Chlorodyne and Brandy at home. Salines.
15	„ 13	1	...	25	7½ „	7 „	1	...	Partially collapsed, fell into complete collapse, Cramps.	Brandy and Laudanum at home Saline Emetic and Draughts.
16	„ 13	...	1	70	20 hours	1 hour	...	1	Deeply collapsed, urgent dyspnœa.	Hot brandy and water.
17	„ 14	...	1	9	6½ days	6 days	1	...	Collapsed, passed blood from bowels, incessant vomiting.	Saline draughts, Hot stimulants, Pot. Chlor.
18	„ 15	...	1	5	18 hours	12 hours	..	1	Deeply collapsed, cramps, Coma.	Saline emetic and draughts, Hot stimulants.
19	„ 15	1	...	25	16¼ days	16 days	1	...	Partially collapsed, cramps, bloody stools, Uræmia.	Do. do. do. blisters and Chlorodyne, Pot. Chlor.
20	„ 16	1	..	50	6¼ „	6 „	1	...	Do. vomited worms.	Do. do. do.
21	„ 17	...	1	25	13¼ „	13 „	1	...	Do. violent pain in abdomen, Uræmia, obstinate constipation occurred. Menstruated at expected time.	Do. do. purgatives and enemata.

22	,,	18	...	1	30	14½ days	14 days	1	...	Deeply collapsed, 7th month of pregnancy, semi-comatose, delivered of still born child on 23rd.	Do. do. with Chloroform, blisters and food.
24	Dec.	19	...	1	24	6½ ,,	6 ,,	1	..	Collapsed, cramps, Uræmia. Menstruated at expected time.	Saline draughts, Hot stimulants.
25	,,	19	...	1	7	11 ,,	10 ,,	1	...	Partially collapsed, vomited worms.	Saline emetic and draughts.
26	,,	19	1	...	37	10¼ ,,	9 ,,	1	...	Recovering on admission.	Food, tonics.
27	,,	21	...	1	7	15 hours	8 hours	...	1	Deeply collapsed, cramps.	Saline emetic and draughts, Hot stimulants.
28	,,	21	...	1	4	5 days	4¾ days	...	1	Do. do. severe cramps, passed worms, coma, convulsions.	Do. do. blisters, Pot Chlor.
29	,,	22	1	...	6	Unknown	9 ,,	1	...	Deeply collapsed, brother of last patient, passed worms.	Do. do.
30	,,	26	1	...	10	11¼ days	11 ,,	1	...	Deeply collapsed.	Do. do.
31	,,	26	...	1	35	Unknown	8½ hours	...	1	Do. severe cramps, dyspnœa.	Do. do.
32	,,	26	1	...	27	3½ days	3 days	1	...	Very feeble, but not collapsed.	Do. do.
33	,,	28	1	...	30	11½ ,,	11 ,,	1	...	Deeply collapsed, severe cramps, hiccup.	Do. do. Hot stimulants, blister.
	1867.										
36	Jan.	1	1	...	40	2 ,,	30 hours	..	1	Collapsed, Dyspnœa and pain in chest, cramps, Bloody stools.	Do. do. do.
37	,,	2	1	...	75	7 ,,	7 days	1	...	Partially collapsed, Dyspnœa, cramps.	Do. do. with Chloroform.
39	,,	4	1	...	50	28 hours	22½ hours	...	1	Deeply collapsed, Dyspnœa.	Do. do. Hot stimulants.
42	,,	5	..	1	24	36 ,,	36 ,,	1	...	Hospital nurse. Not collapsed, a mild case.	Do. do.
43	,,	8	1	...	60	2½ days	34 ,,	...	1	Partially collapsed, severe cramps, bloody stools, coma.	Do. do. with Chlor. do.
44	,,	8	1	...	25	14¾ hours	7¼ ,,	...	1	Collapsed, cramps, rapid sinking.	Do. do. do. do.
46	,,	11	1	...	26	6 days	6 days	1	...	Partially collapsed, cramps, bloody stools.	Do. do. do. do. Pot. Chlor. Dry cupping, Quinine.
47	,,	16	..	1	25	Unknown	3½ hours	...	1	Deeply collapsed, rapid sinking, Police case.	Do. do. do.
48	,,	17	..	1	25	6 days	5 days	1	...	Partially collapsed, very feeble.	Saline emetic and draughts.

Table I.—Continued.

NATIVES.

No. of Case.	Date of admission.	Sex. M.	Sex. F.	Age. Yrs.	Duration of Disease from commencement to termination.	Time in Hospital.	Result. Recovered.	Result. Died.	Condition on admission; concomitant symptoms.	Treatment.
	1867.									
49	Jan. 18	1	...	20	22¾ hours	10¾ hours	...	1	Deeply collapsed, violent cramps.	Saline emetic and draughts with Chloroform. Cupping to loins.
51	Feb. 2	1	...	21	8 days	8 days	1	...	Not collapsed, but very weak.	Do. do. aromatic stimulants and food.
52	„ 3	1	...	7	8 „	8 „	1	...	Partially collapsed.	Emetic.
54	„ 7	1	...	30	Unknown	23 hours	...	1	Deeply collapsed, severe cramps, Intense thirst, obstinate vomiting.	Saline emetic and draughts, Hot stimulants.
55	„ 7	1	...	50	....	....	1	...	Collapsed, severe cramps.	Do. do.
56	„ 12	...	1	2	26 hours	¾ hours	...	1	Dying.	External heat, Warm food and brandy.
57	„ 18	...	1	30	16½ days	16 days	1	..	Deeply collapsed, Urœmia. In 3rd month of pregnancy. Did not abort.	Saline emetic and draughts, Hot stimulants, Cupping to loins, aperients, blister.
58	„ 21	...	1	50	36 hours	22½ hours	...	1	Collapsed, severe cramps, rapid sinking, starved.	Acids at first. Cholera saline, stimulants.
59	„ 26	1	...	30	7 days	7 days	1	...	Not collapsed, but much sunken.	Astringents, Calomel and Dover's powder, Saline.
60	„ 24	1	...	44	5¼ days	5 days	1	...	Not collapsed.	Acid, Rhubarb, food.
61	March 1	1	...	22	5½ „	5 „	1	...	Do. but very weak.	Astringents and stimulants.
62	„ 3	1	...	42	18 hours	6¾ hours	...	1	Collapsed, cramps, no rallying.	Saline emetic and draughts, with Chloroform.
		26	23				30	19		

TABLE II, *showing the localities from which the 62 patients were brought.*

John Pereira's...............	10
Brought by Police.........	9
New Town..................	8
Poodoopettah...............	6
Chintadrepettah..........	5
Mount Road................	5
Pursewaukum..............	4
Black Town.................	4
Near Hospital..............	4
Fort..............................	3
Chepauk........................	2
Royapoorum..................	1
Vellore..........................	1
Total...	62

Although the number of cases under review was but 62, and the influence of season, sex and age was not very marked, it appears to be advisable, for the sake of uniformity, to continue the tables given in my former report.

TABLE III, *showing the number of admissions, recoveries and deaths in each of the months during which the epidemic influence prevailed.*

MONTHS.	Europeans.			Eurasians.			Natives.			Total.			Percentage of total	
	A.	R.	D.	A.	R.	D.	A.	R.	D.	A.	R.	D.	Recoveries.	Deaths.
November (10 days)	0	0	0	2	2	0	1	0	1	3	2	1	66·667	33·333
December.......... ...	2	0	2	2	1	1	27	19	8	31	20	11	64·516	35·484
January...............	1	0	1	5	4	1	10	4	6	16	8	8	50·000	50·000
February...	1	0	1	0	0	0	9	6	3	10	6	4	66·667	33·333
March (3 days)... ...	0	0	0	0	0	0	2	1	1	2	1	1	50·000	50·000
Total......	4	0	4	9	7	2	49	30	19	62	37	25		
Percentage of Recoveries.	...			77·778			61·224			59·677				
Do. of Deaths....	100·000			22·222			38·776			40·323				

This table shows that the law of epidemics alluded to in my former report,—namely, that in the commencement of the outbreak the disease is more severe and fatal, and that the cases decline in severity and fatality, as the epidemic declines,—was not observed as regards the cases treated at the General Hospital on this occasion. However, it may be remarked that the cases are too few in number to allow of correct deductions, and that by far the majority of those brought in the month of January were in a deeply collapsed condition and presented very bad symptoms.

TABLE IV. *Admission, Recoveries and Deaths of each Sex of the three Races treated during the outbreak.*

RACE.	Admitted.		Recovered.		Died.		Percentage of Recoveries.		Percentage of Deaths.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
Europeans	4	...	...	...	4	...	...	...	100·000	...
Eurasians......	6	3	5	2	1	1	83·333	66·667	16·667	33·333
Natives..........	26	23	18	12	8	11	69·231	52·174	30·769	47·826
Total...	36	26	23	14	13	12	63·889	53·847	36·111	46·153

This table affords a good illustration of the impossibility of drawing correct inferences from too small a number of instances; for, taking the European patients alone, we might say that every case of cholera was fatal; and taking the Eurasian males alone, we might infer that the mortality was but 16·667 per cent.; whilst on collecting the above five groups into one class, we find the total mortality of the 62 patients to have been a trifle over 40 per cent. (table iii.) a rate which would have been considerably disturbed by a few more cases, according to their mode of termination.*

* Since this report was submitted this disturbance has taken place, for six more patients have come under treatment, of which five recovered and one died. Adding these cases to the 62 contained in the report, we have a percentage of 61·765 recoveries and 38·235 deaths.

TABLE V.—*The condition of the above 62 patients on admission.*

CONDITION.	Cases.	Recovered.	Died.	Percentage of Recoveries.	Percentage of Deaths.
Deeply collapsed	23	8	15	34·783	65·217
Collapsed with severe cramps..........................	10	3	7	30·000	70·000
,, without cramps	4	3	1	75·000	25·000
Partially collapsed..	17	15	2	88·236	11·764
Not collapsed with cramps	...	...	...	...	...
Not collapsed without cramps.............•......	8	8	...	100·000	...
Total..	62	37	25	59·677	40·323

Upon comparing this table with the corresponding table in the former report, it will be seen that there was a larger proportion of deeply collapsed cases, with an improvement of 23·6 per cent. in the recoveries, and a larger proportion of partially collapsed cases, with 2·7 per cent. less recoveries; that the collapsed cases with severe cramps bore a somewhat less proportion to the total treated than was the case in the former outbreak, the mortality being the same; and that the non-collapsed cases bore the same proportion as before to the total, with an improvement of 25 per cent. in the recoveries.

TABLE VI.—*The Age of the above 62 patients.*

AGE.	Europeans.			Eurasians.			Natives.			Total.			Percentage of total		
	A.	R.	D.	A.	R.	D.	A.	R.	D.	A.	R.	D.	Admissions.	Recoveries.	Deaths.
Under 5 years.	...	...	...	..	...	...	3	1	2	3	1	2	4·839	33·333	66·667
From 5 to 10 ,,	...	...	...	2	1	1	7	5	2	9	6	3	14·516	66·667	33·333
,, 10 to 15 ,,	...	...	...	...	...	...	2	2	...	2	2	...	3·226	100·000	...
,, 15 to 20 ,,	...	...	...	4	4	...	1	...	1	5	4	1	8·006	80·000	20·000
,, 20 to 25 ,,	...	...	...	1	1	...	4	3	1	5	4	1	8·006	80·000	20·000
,, 25 to 30 ,,	1	...	1	1	1	...	11	8	3	13	9	4	20·968	69·231	30·769
,, 30 to 35 ,,	1	...	1	1	...	1	7	5	2	9	5	4	14·516	55·555	44·445
,, 35 to 40 ,,	...	...	...	...	...	...	2	1	1	2	1	1	3·226	50·000	50·000
,, 40 to 45 ,,	1	..	1	...	...	...	4	1	3	5	1	4	8·006	20·000	80·000
,, 45 to 50 ,,	...	...	...	...	...	...	1	1	..	1	1	...	1·613	100·000	...
,, 50 to 70 ,,	1	...	1	...	...	...	5	2	3	6	2	4	9·677	33·333	66·667
Above 70 ,,	...	...	...	...	...	...	2	1	1	2	1	1	3·226	50·000	50·000
Total...	4	...	4	9	7	2	49	30	19	62	37	25	100·000	59·677	40·323

The per-centages in this table vary considerably from those of the corresponding table in the former report. But this is not in the least surprising, as no one would for a moment expect that in each successive outbreak of epidemic disease, the cases would happen always in the same proportion among persons who have reached a particular age. However, if quindecennial periods are taken, it will be seen that there is some correspondence between this table and that given for the former outbreak, and the general result remains, viz., that no age is exempt from the disease.

The Epidemic. In three cases there was a history of previous diarrhœa continuing for two or three days; in the rest the symptoms of cholera set in suddenly.

Duration of the Disease in the Fatal Cases.—A reference to Table II will show that in by far the greater number of the fatal cases, death happened within a short time after admission into hospital, the periods being as follows:—within 1 hour, 3 cases; under 3½ hours, 2 cases; under 5 hours, 1 case; under 8 hours, 4 cases; under 12 hours, 3 cases; under 18 hours, 3 cases; under 24 hours, 3 cases; under 36 hours, 4 cases; at 3¼ days, 1 case, and at 4⅝ days, 1 case.

Uræmia.—In the two last mentioned and in one of the 36 hours cases the patients died comatose from uræmic poisoning, the only cases which proved fatal from this condition, though it was observed to be well marked in 12 of the patients, 9 of whom recovered.

Hæmorrhage from the bowels.—In 10 cases the dejections either contained partially coagulated blood, or were of a deep pink grumous tint from admixture of that fluid. Of these, 6 proved fatal. I look upon hæmorrhage from the bowels in cholera as a symptom of very serious import, showing an alteration of grave character in the condition of the blood, probably liquefaction of the blood corpuscles. In the later cases in which the symptom occurred, the treatment pursued was that recommended by Mr. Blacklock, viz., the exhibition of full doses of quinine, calomel, and camphor.

Acarides lumbricoides. In nine instances a note was taken of the passage of ascarides from either the stomach or bowels. One of these patients, a little child, subsequently died convulsed of uræmia. The above number does not represent all the cases in which the passage of worms occurred; it is so

common that it is almost unnoticed. The generality of the natives of Southern India are infested with these parasites, and their being evacuated when a patient is suffering from cholera, appears to me to be simply a mechanical matter. In conversing with me upon the frequency of this occurrence, Dr. W. Aitken very happily expressed his idea thereon, by saying "It is merely the rats running out of the empty house." Instead of looking upon the ascarides as having anything to do with the causation of Cholera, either in a predisposing or exciting point of view, I rather consider that the Cholera condition is a powerful anthelmintic, under the influence of which the parasites, if present, must necessarily be expelled; the drain which takes place from the blood dislodges them, and subsequently they either pass off with the intestinal discharges, or migrate to the stomach, and are from thence vomited.

Menstruation. Two women menstruated on recovery from the disease; one, case 21, table ii. at the proper period, the other, case 1, stated that the catamenia had been suppressed for four months.

Pregnancy. Two pregnant women were admitted. One in the 7th month, case 22, table ii. She was deeply collapsed and suffered from uræmia, remaining semi-comatose for some days. She was delivered whilst in this condition, on the 5th day after admission, and was discharged well on the 14th day. The other woman was in the third month and she did not abort. She suffered slightly from uræmia and was kept in hospital for sixteen days under the expectation that abortion would take place.

Contagion. Two patients were brought from houses where deaths from Cholera had occurred the day before they were seized. The following two cases may also be looked upon as instances of contagion. The nurse specially engaged for the Cholera ward, case 42, was taken ill with symptoms of Cholera, on January 5. She had been hard worked and harassed, and had partaken of plain cold boiled rice the night before. She did not pass into collapse but was very weak and sunken, and had suppression of urine with copious vomiting and purging of rice-water fluid. She immediately applied for treatment, and in 36 hours had recovered and insisted on resuming her usual duties.

Case 41, a Medical Student of the College Junior Department, was attacked on the 4th January. He was a poor, ill-

fed lad, deeply pitted with small-pox cicatrices. He had visited the Cholera wards once daily for about a week, but never came into constant or close contact with the patients as the attendants, the medical subordinates and I did. His residence was in Chintadrepettah and it was there he was seized. His was the most severe case which has come under my cognizance in which recovery took place. He suffered severely, was collapsed for three days, then became comatose, and remained so several days; and had not recovered until the thirty-second day, at which time he remained very weak.

One other case merits particular notice. Case 34, a powerful, finely-built European of 25 years of age, of dissipated habits, who had recently been in hospital for Ebriositas, bordering on Delirium Tremens, was brought by the Police on a stretcher, on the morning of December 30th. He had nothing on but a flannel shirt, and was picked up in this condition in a bye-street in Vepery. He was covered with filth, and whilst being washed he had an epileptiform fit. He was removed to the Cholera ward and was found to be deeply collapsed, but his voice was quite strong and he was able to give an account of himself, which subsequent enquiries proved to be partially incorrect. He said he had been drinking in company with a European and being very drunk, he was robbed of money and clothes and thrown out into the street where he lay all night. Vomiting occurred and profuse purging of rice-water dejections, deeply tinged with blood. He was quite pulseless, icy cold and covered with clammy exudation. Warmth was assiduously applied and stimulants both externally and internally used. He had a presentiment of death, asked where and how he would be buried, and gave the address of his friends in England. He never rallied, and within 3½ hours of being brought in he died, affording another instance of how intemperance and exposure may proclive to this dire disease

Treatment. I am content, at present, to acknowledge my ignorance of very many points connected with Cholera, and therefore am not ashamed to own that I have followed something of a routine, though not merely an empirical, plan of treatment. My intentions were, that during this outbreak all the cases should be treated alike so as to give a fair trial to the saline treatment, *i. e.* the exhibition of the Saline Emetic and Draughts described in my former

report. This was done in the greater number of cases, but a few exceptions occurred. In cases 1, 26, 60 and 61, the salines did not seem called for; cases 6, 16, 34, and 56 were entirely beyond the hope of relief; and in a few cases, admitted during my absence, the treatment was commenced by the administration of acids and opium. Otherwise, the treatment of both the primary symptoms and the complications was that detailed in the former report. The general result is, that the mortality has been about 40 per cent.; not quite so encouraging as I had hoped it would be, but still, considering the very severe character of the majority of the cases, I think it may be looked upon as favourable. It is 5½ per cent. more favourable than the mixed treatment employed at the General Hospital during the former epidemic, and from 12 to 22 per cent. better than the results obtained last year, so far as I can glean from the Journals, in London, Belgium, and Holland.

Disinfection.—I have used Carbolic Acid as a disinfectant. At first diluted with 200 times its bulk of water, then double this strength, and lately diluted with 50 times its weight. The Carbolic Acid does not destroy the texture of fabrics, so it is now employed for sprinkling on the bed clothes and for steeping the soiled linen in. But I have again resorted to McDougall's powder for use in the vessels receiving the discharges, and for dusting freely on the floor under the cots, as I have an impression that the combination of carbolate and sulphite is more decidedly deodorant and disinfectant than the carbolic acid *per se.*

ART. XVI.—*Supplementary Report on Cholera at the Royapettah Dispensary.* By Surgeon-Major P. G. FITZGERALD, M.D., Surgeon 4th District.

(Communicated by the Inspector General, Indian Medical Department.)

I HAVE the honour to submit the following Supplementary Report of Cholera as treated in the Royapettah Hospital, from the 17th November 1866 to the 13th of March 1867.

2. During that period 35 cases of the disease were admitted into the Hospital, and 77 prescribed for as out-patients. The same reasons which compelled me to omit the latter class of patients from consideration in my former Report, necessitate their exclusion also from the few remarks I have to make on this occasion.

3. Of the 35 cases admitted, 17 died and 18 recovered. The time in hospital of the fatal cases varied from a few minutes to 48 hours, the average being 14 hours. Of those that recovered, the shortest time was 3 days, and the longest 18 days, average 7½ days.

4. All were undoubted cases of Cholera, presenting the well-known rice-water evacuations, and the characteristic countenance, the sunken eye-ball and congested conjunctival vessels. Cramps were present in 9 cases only, of whom 4 died and 5 recovered.

Ten cases were affected with intestinal worms, and of these, 2 died and 8 recovered.

In one case abortion took place in the fifth month of pregnancy. This patient recovered, but had a tedious convalescence from bed-sores.

5. Both sexes were nearly equally represented in the admissions, there being 17 males and 18 females, but there was a marked difference in the results. Thus, of the 18 females admitted, 12 recovered and 6 died ; but of the 17 males, 11 died and 6 only recovered.

6. This apparent influence of sex on the result was also observable in the cases which formed the subject of my former report, although I did not specially allude to it, as it was not so strongly marked as in those now under consideration. For example, of the 45 cases therein mentioned, the

result of which was known, 24 were males with a mortality of 12 ; and 21 females with a mortality of 8 only. Taking the entire number of 80 cases of cholera treated since the commencement of the epidemic, the mortality among the male patients was in the ratio of 56 per cent., and among the females 36 per cent. nearly.

7. I am at present unprepared to suggest any explanation of this well-marked difference which, I am aware, is not in accordance with the experience of other Medical men.

I have on a former occasion alluded to the coincidence between the existence of worms in the intestinal canal, and a tendency to recovery from an attack of cholera, which I had observed on many occasions in the course of previous epidemics, and that observation receives further confirmation from the result of the cases now under review. If this apparently preservative complication had been exclusively or chiefly confined to patients of the female sex, the explanation of the difference in the ratio of deaths above adverted to would be obvious. But I find that the ten cases which were affected with worms were equally divided between the two sexes, and it is worthy of remark that the only two fatal cases presenting this complication were of the male sex.

8. It would be irrational and absurd to deduce any general law from, or found any theory upon such scanty materials and limited experience, but the facts and figures above stated though few are certain, and it is no less true that, as far as they go, they indicate a greater tendency to recovery from cholera in the female than the male sex.

9. The plan of treatment described in my former report was adhered to throughout the whole course of the epidemic. It has the merit of being simple in practice, and intelligible in its principle and aim to the Native Dressers attached to the hospital, and considering the class of persons who were the subject of treatment, and the hopeless condition in which many of them were, when brought to hospital, a mortality of 46·25 per cent. is not, I think, an unfavourable result.

ART. XVII.—*Note on some effects of the Oil of the Cashew nut (Anacardium occidentale).* By Assistant Surgeon W. H. MORGAN, 23rd W. L. I.

IN the month of March last two men were admitted into the hospital of the 23rd Regiment within a day of each other with hæmoptysis; the alleged exciting cause being by no means an ordinary one, the following cases may be deemed worthy of record.

March 3rd, 1867.—Regimental No. 387, Private Hurry Persaud, No. 1 Company, aged 30, service 11 years. Admitted last evening at 7, complaining of having spat up quantities of blood of a bright red colour since 2 P. M. Patient was on duty at the Fort, and had been to take his mid-day meal to the regimental lines and gone back. The meal consisted of rice, dholl, and ghee. About an hour after his return he suddenly felt an inclination to vomit, and coughed up a quantity of bright blood; he washed his mouth and face in cold water, and fell asleep; in about an hour the vomiting recurred. He vomited again after his admission into hospital, and the Dresser attached to the regiment confirms the man's statement that the blood was of a bright red colour, but he did not measure the quantity. He gave him draughts of sugar of lead with dilute acetic acid and laudanum. Two or three of these draughts checked the vomiting, and the man was discharged from hospital on the 5th instant.

The second case was a graver one, the symptoms severer, and not so easily checked, and the patient died ultimately of phthisis, but I would draw attention to the alleged exciting cause of the hæmoptysis.

March 3rd, 1867.—Regimental No. 380, Private Seetiah, No. 1 Company, aged 30, service 10 years. Admitted at 6-30 this morning, complaining of having spat up bright blood since 8 A. M. yesterday. He was Orderly to one of the Staff on that day, and coughed up a quantity of blood as he was carrying a letter. The vomiting recurred several times during the day, but the man did not report sick till this morning. The Dresser administered the same remedies as in the preceding case, and the vomiting appeared to have been

checked when I visited the hospital. Wishing to enquire further about these cases, I returned at noon; calling the men into the Surgery I had some conversation with them, and after dismissing them, I was about entering their cases in the journal, when I heard the second patient vomiting. He brought up 6 oz. of bright red blood. He had taken his rice with mutton and brinjall curry at 11 A. M., but in the vomited matter there was no particle of food; pulse 108; skin of natural temperature; no pain in the chest or abdomen. Ordered the sugar of lead draught to be continued until ice could be procured.

Vesp.—Brought up 20 oz. of blood since I saw him this afternoon; pulse 108.

8-30 P. M.—Coughed up blood again, but not in large quantity, the amount thrown up during the night will be given to-morrow morning; pulse the same.

4th.—Coughed up blood again at 1 A. M., the quantity measured this morning amounts to 10 oz.; skin hot; pulse 108; bowels confined; has begun vomiting again.

Vesp.—Vomited 7 oz. of blood while the above entry was made, but not since; bowels moved twice; skin hot. Subsequently only 2 oz. of blood mixed with frothy mucus were coughed up, and the sputa were still later tinged with blood.

Treatment.—As long as the hæmoptysis continued, the patient had ice to suck, iced cold water to drink, an ice bag externally for a short time, and draughts in which either sugar of lead, the oil of turpentine, the infusion of matico or gallic acid were the active ingredients; a dose of aperient medicine was given on the second day and absolute rest enjoined.

Both these men attributed the vomiting of blood to (incautiously) inhaling the acrid fumes of cashew nut oil with which they had latterly been in the habit of polishing the stocks of their muskets. Of this nut (Anacardium occidentale) Colonel Drury says:* "The pericarp contains a black acrid oil which, owing to its caustic properties, is often applied to floors or wooden rafters of houses to prevent the attacks of white ants. It requires, however, to be used cautiously. This oil is called Cardole and is a powerfully vesicating agent. It is applied to warts, corns, ulcers, &c., but it is

* Useful Plants of India, edition 1848, page 33.

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said that the vapour of the oil, when roasting, will produce violent swelling and inflammation."

I was informed by both the patients and the hospital havildar that there were several men in the lines who had suffered from a train of symptoms (to be presently given) since they began the use of cashew nut oil for the purpose before mentioned. Bearing in mind the disposition of sepoys to magnify trifles, I examined above a dozen individuals, and from the following statement there can be no doubt that they corroborate each other in most particulars. The old operation of polishing stocks (with a rag dipped in cocoanut oil) was comparatively easy, while the new one necessitates expression of the oil from the pericarp of the cashew nut, and more manual exertion than would suit the indolent. The cost of the oil to men who have no spare cash was another consideration, but most of those I asked declared that there was no difference in the expense of the two processes. There can be no question as to the superiority of the polish.

1. No. 596, Private Padeyah, No. 1 Company, has had a burning sensation in the eyes and stomach, and also in the palms of the hands since the 2nd March 1867. Believes these symptoms to be owing to the fumes of cashew nut oil which he uses in polishing the stock of his musket. He used the oil for two months, but it was only four days ago that he felt the above. Has been generally in good health.

2. No. 872, Chendreyah, No. 5 Company, has slight injection of the sclerotic conjunctivæ, to which he has been subject for the last month, which he attributes to the use of cashew nut oil as in the preceding case. Has also had burning of the eyes, nose, hands and soles of the feet, and of the stomach. Has been using cashew nut oil for the last month; general health, good.

3. No. 288, Iamayer, No. 3 Company, has slight rawness of the right palm, and an ulcerated patch an inch square on the right fore arm. About fifteen days ago had a swollen face, also burning sensations in the chest, stomach, eyes, hands, some cough; all which he attributes to the use of cashew nut oil as in preceding cases. Used it for two months.

4. No.——, Chinnasawmy Naigue, No. 1 Company, stated that he had bleeding from the nose for last three days, burn-

ing of the eyes, stomach, and palms of the hands. Uses cashew nut as in preceding cases for cleaning stock of musket.

5. No. 327, Naigue Sheik Homed, No. 5 Company. Has a burning sensation in the eyes and nostrils, in the throat and stomach, conjunctivæ injected, has had epistaxis once in two days; attributes these symptoms to the use of cashew nut oil as in preceding cases, begun its use for cleaning a month and a half ago. The burning sensations set in ten or fifteen days ago.

6. No. 680, Private Rungasawmy, No. 6 Company. Has had a burning sensation in eyes, nostrils and stomach for the last seven or eight days; attributes these symptoms to the use of cashew nut oil. Has used the oil for a month or a month and a half.

7. No. 460, Private Sheikh Massoon, No. 1 Company. Has had burning sensations in eyes, nostrils and stomach for twenty days; attributes them to the use of cashew nut oil. Has used the oil for a month and a half.

8 No. 804, Private Oosman Khan, No. 5 Company. Has had burning sensations in the eyes, nose and stomach for last month; describes the feeling in the last-named organ to that experienced when quicklime is taken; conjunctivitis present; used the oil for two months.

9. No. 225, Private Sheikh Abdoolla, No. 1 Company. Same symptoms as preceding case; has used cashew nut oil for more than two months.

10. No. 281, Private Annamanthoo, No. 1 Company. Rawness of hands and other symptoms as in two preceding cases; used cashew nut oil for two and half months.

11. No. 851, Private Sheikh Mooltan, No. 1 Company. Agrees in the statements made by last three cases; used the oil for two months.

12. No. 850, Private Mariappah, No. 1 Company. Corroborates preceding cases, having suffered similar symptoms; used cashew nut oil for two months.

PART II.

REVIEWS AND NOTICES OF BOOKS.

On Inhalation, as a Means of Local Treatment of the Organs of Respiration, by Atomized Fluids and Gases. By HERMANN BEIGEL, M.D., L.R.C.P.L., &c. &c. London: Robert Hardwicke, 1866, 8vo. pp. 200.

THE tendency of Physicians in the present day as regards diagnosis is to multiply physical means, and to this we owe the introduction of the speculum, the ophthalmoscope, the endoscope, the laryngoscope, the thermometer, the sphygmograph, &c. as instruments having their proper use and value; and in his preface Dr. Beigel claims something similar as regards Therapeutics, for he says :—

"The treatment of our days endeavours to become *local*, wherever it is feasible. Two excellent results have recently been obtained in this direction, the one is the *hypodermic injection*, by Alexander Wood, in Edinburgh, and the other the *inhalation of atomized fluids*, by Sales-Girons."

As a justification of Sales-Girons' endeavours to improve the means of inhalation, leading him to the invention of a portable apparatus for the pulverization of fluids, our author says :—

"The value of inhalations is the greater as they render great services in those illnesses which generally prove fatal to a vast number of the human race, viz., diseases of the organs of respiration. Chronic bronchitis is one of those foes which medicine opposes but feebly; consumption and death are still almost synonyms; and although inhalations cannot boast of being able to *cure* phthisis, yet in many cases they are able to alleviate troublesome symptoms, and to place the patient in such a position as will enable him to pursue his ordinary avocations in life. At all events, it cannot be doubted any longer that inhalations have proved serviceable, where a long-continued use of other medicaments failed.

"Here I should not like to be misunderstood. I do not consider inhalations a Panacea for chest diseases; far be it from me to do so

I merely intend to show that, when applied to the appropriate cases, the atomized fluids are very valuable agents, and deserve to range prominently in the Materia Medica."

Dr. Beigel divides his work into two parts :—I, On Inhalation in general ; II, On Inhalation applied to Special Diseases, containing the details of thirty-two selected cases, in which atomized fluids were beneficially employed. In the first chapter he gives a historical sketch of inhalation, from which we learn that pulverized fluids were first used as medicaments by Auphan in 1849, but very imperfectly and only in an inhalatory, it being left for Sales-Girons to convert the fluid into a fine mist, and to construct a portable apparatus which could be used in every private dwelling. The second chapter enters upon the consideration of whether the atomized fluids pass the larynx and trachea and penetrate into the lungs, which those who have "an innate dislike to everything called progress" answer in the negative. However Demarquay, using a solution of perchloride of iron, demonstrated upon rabbits that the iron reached the mucous membrane of the larynx, trachea and bronchi, and, using a solution of tannin for oral inhalation in a woman who had a tracheal fistula, he proved that the atomized fluid passed through the larynx, for its chemical action was produced on a test paper with which the tracheal fistula was closed. Trousseau early gave his adherence to Sales-Girons' views and "expressed his astonishment how the penetration of atomized fluids could be doubted, since the penetration of coal particles, crystals, and the like into the bronchi and lungs form an established fact." Dr. Beigel appeals especially to his English readers by calling their attention to the researches of Drs. Peacock, Bristowe and Greenhow into the nature of grinders' asthma and phthisis and miner's black-lung, and concludes thus, the sentence being printed in italics :—

"It is, therefore, confirmed beyond doubt that atomized fluids enter the respiratory tract and penetrate into the very cells of the lungs; that, therefore, by means of inhalation, remedies most appropriately and successfully may be applied to the organs of respiration."

Our author next gives us a description of the apparatus used for atomizing the fluids. Those who are familiar with *Rimmel's Perfume Odorateur* will at once understand the apparatus now generally used. It essentially consists of two

small tubes open at each end, the apertures at one end being contracted; the tubes are placed at right angles to each other with the narrow apertures approximated, the larger end of the vertical tube dipping into a vessel containing the fluid to be atomized, whilst a blast of air is driven through the horizontal tube, producing a vacuum in the other, in which the fluid rises by aspiration and is turned into fine mist on leaving the capillary opening. In the *Odorateur*, the mouth of the operator furnishes the blast, but in the inhalation atomizers, as it is of importance that the inhaler should be independent of assistance, the blast is produced by other means. Dr. Bergson invented a bellows apparatus consisting of a caoutchouc tube, about a yard in length, attached by one end to the larger mouth of the horizontal tube, and having its middle and other end expanded into a ball, the middle ball being an air-reservoir, and the other a bellows to be compressed by the hand of the patient. Dr. Richardson's "hand ether spray producer" is in reality this vaporizer of Bergson. Other inventors produce the blast by compression of the air contained in a brass receiver fitted with a stop cock, to which is attached the horizontal tube; the compression being effected by some by the use of an air-pump, by others by means of steam, a small boiler and spirit lamp taking the place of the tube and bellows of Bergson. This latter apparatus is that which is generally preferred and it can be made very portable. Dr. Beigel has improved the apparatus by adding a screen. He found that from all the vaporizers, the cloud of steam—an expanding cone—not only entered the patient's mouth, but was also propelled against the face and eyes, producing discomfort and irritation when acrid substances were used. His screen we will describe in his own words:

"It consists of a turned wooden disc, which is hollowed funnel-like, prolonged in the middle into a mouth-piece with an opening of the size of a shilling. The rim is turned inwards, having on its lowest point a small opening, into which a gutta-percha tube is fixed, the end of which may be put into any glass, and through which the fluid, created by the superfluous steam and subdivided vapour, runs. The disc, fixed by means of an arm to a stand, can be lowered or heightened, and moved in every direction, *ad libitum*. The whole apparatus is placed between the inhalation apparatus and the inhaler, who sits comfortably with her opened mouth before the mouth-piece of my screen, inhaling the atomized jet coming through it."

Our author next indicates some points to be observed in inhalations. First, it will be necessary to use tubes with capillary openings of different sizes according to the diseases to be treated, as the minuteness of the spray is in proportion to the minuteness of the tube apertures. Secondly, as to the mode in which the inhalations may be performed. They have been found useful in conjunctivitis and keratitis, in affections of the ear, upon ulcers, &c., as well as upon the organs of respiration. Again

"As the respiration is performed more or less powerfully and deeply, the atoms of the pulverized fluid reach the more or less distant organs of that function. From this fact it becomes self-evident that it will be necessary to inspire feebly if the influence should be directed upon parts situated in the mouth or pharynx, more powerfully and sometimes strenuously if it should be our intention to act upon the larynx, trachea, or lungs. And, further, as the lungs admit the greatest amount of air when the sitting position is assumed, it is manifest, that we should place the patient in that position if we intend a deep penetration of the atomized cloud, whilst we should allow him to stand if we merely intend to act upon organs not so far distant."

Some persons are so nervous and excited that they are some time before they can accustom themselves to the inhalation. Pure water or even milk may be used in such cases until the sensitiveness has passed away.

The *temperature* of the atomized cloud, varies in proportion to the distance from the spout of the apparatus. If necessary, the fluid may be warmed by a spirit lamp placed beneath the vessel containing it. It is well to personally superintend the first inhalation; the patients may be directed to make a hundred inspirations at first, making a pause of a few seconds after every ten or fifteen deep inspirations which should be performed deliberately and without hurry. The number of inhalations may be increased on subsequent occasions.

The tubes should be cleaned after each inhalation by keeping the apparatus in action, pure water supplying the place of the fluid which has been used.

In the sixth chapter Dr. Beigel treats of the medicaments used in inhalation, and commences by saying,

"Generally speaking every chemical body which is soluble can be atomized, and therefore inhaled. Thus the greater number of

remedies contained in the 'Materia Medica' can be used for the local treatment of the respiratory organs.

"But it must be borne in mind that besides the local effect of the spray, absorption takes place also, and that the medicaments are even much more readily absorbed through the mucous membranes than they are by internal application—a fact which must be taken into consideration when the dose is to be decided on."

Of course if a new edition of Dr. Beigel's work be called for, he will re-write the second paragraph of the above extract, for we presume he does not mean to assert that medicaments are not as much internally applied when inhaled as when carried into the stomach, but rather that they are more readily absorbed by and more directly act on the pulmonary, than the gastric, mucous membrane. Further on we learn exactly what he means, for he says: —

"There exists, therefore, the one great difference that—with inhalation the local action is obvious; with medicaments internally given, is often highly problematical."

The following medicaments are the most serviceable for inhalation.

Nitrate of Silver, three to five grains in an ounce of distilled water. In inflammatory conditions of the pharynx and larynx.

Nitrate of Aluminium, two to five grains in an ounce of water. In inflammatory and nervous affections of the larynx and trachea.

Tannin, one to ten grains in an ounce of water. Astringent and styptic, in chronic catarrhs.

Alum, one to twenty grains in an ounce of water or aromatic infusion. Styptic, and better than gargles in inflammatory conditions of the fauces.

Sesquichloride of Iron, five to twenty-five minims (of the Tincture) in an ounce of water. Very valuable styptic in hæmoptysis.

Acetate of Lead, three to ten grains. In inveterate, troublesome colds.

Sulphate of Zinc, one to ten grains. Weak solutions in chronic inflammation of the respiratory mucous membrane; strong solution as inhalatory gargles.

Common Salt, three to twenty grains in an ounce. In all stages of consumption.

Tincture of Opium, five to twenty minims in an ounce. In troublesome cough when not contra-indicated.

Liquor Arsenicalis, five to ten minims in an ounce of water. In inveterate cases of asthma.

Pure water, cold, warm, or hot. Of great service in inflammation and paralysis of the larynx.

Glycerine, destroys fœtid odours and is useful in laryngitis and tracheitis associated with hoarseness and loss of voice.

Lime-water, one part lime to one hundred parts water. A *powerful* solvent of the exudative membranes of diphtheria.

The salts of iodine, bromine, chlorine, &c. have also been used, and lastly Dr. Beigel tells us, as if to show how a hobby may be ridden:—

"In conclusion, *cod-liver oil* may be mentioned. It can also be turned into a spray, if an apparatus is used with rectangular tubes, the openings of which are wider than usual, and a larger flame than commonly necessary is kept up. Although I am led to believe that the administration of cod-liver oil by means of inhalation would prove much more convenient and beneficial than when that substance is internally taken, yet it has the inconvenience that the room wherein the atomization has taken place for many weeks retains the smell of the oil, so that the administration in the form of spray could only be effected in hospitals, where a separate room could be spared for the purpose wherein the patients would remain for some hours of the day, being entirely involved in clouds of cod-liver oil."

Dr. Beigel next relates certain immediate effects of inhalation which must be known to the physician to enable him to predict them to the patient. After which we have a description of the arrangements most suitable for inhalations in hospitals and dispensaries, and for the inhalations of gases, especially oxygen. As we have hinted at a slight inclination on the part of our author to ride a hobby, it is but justice to make the following quotation:—

"In conclusion, it might not be amiss just to mention, that recently certain vapours, obtained during the process of purification of common burning gas, have been applied for whooping-cough. From different parts of the Continent cases have been reported in which cure was effected very rapidly. In many of these reports an enthusiasm prevailed which very often takes possession of such new inventions and adorns the reports with a hue which vanishes before the rays of cool, critical investigation. At all events, there are not yet reports enough to enable us to express an opinion as to the value of this new medicament."

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The second part of the work is devoted to a relation of cases in which inhalation has formed the principal element in the treatment, prefaced by a few pathological remarks. The following are the diseases treated of—Laryngeal Hyperæsthesia; Œdema glottidis: Laryngitis; Croup; Diphtheria; Bronchitis; Asthma; Emphysema; Hæmoptysis; Phthisis; Gangræna Pulmonum; Whooping Cough.

We cordially welcome Dr. Beigel's book, and believe that he has shewn an enlightened appreciation of a mode of treatment of affections of the respiratory organs, which deserves a far more general use than it at present enjoys. The aim of the author is so well shewn in his "conclusion," that we give it entire.

"I should not like to conclude these pages without making the following remarks on the cases contained in the second part. They were selected out of a considerable number of which I possess notes, too numerous to be incorporated with this treatise, without making it more voluminous than was intended. With a very few exceptions, the cases are such as have been cured or very much improved by inhalation, and this is just the point at which I am aiming. It was by no means my intention, presenting cases only in which the inhalatory treatment has been applied successfully, to show that such results will always be obtained by the administration of atomized fluids. That was not my purpose. Inhalation not being generally used, or even known, I, being convinced that it deserves a prominent place in the treatment of pectoral disease, was anxious to prove—particularly to those gentlemen who proclaim it to be void of any value—that a cure can be effected by the new method, and I may add, in a manner which gives, provided the case be apt for inhalations, the preference to that method over all other kinds of treatment.

"The final aim of every physician is to *cure* the patient, and I do not consider that we are justified in protracting a disease or allowing a patient to die, without having exhausted every possible therapeutic means; but my intention was to show that inhalation is a source by no means to be neglected in diseases of the organs of respiration. He who expects wonders from that mode of treatment will soon be disappointed; he who recommends it as an infallible one, will prove a false prophet; but an unprejudiced application of the atomizer will lead to the conviction that the invention of Sales-Girons has been a most valuable addition to therapeutics."

As regards "the get up" of the book, Mr. Hardwicke's name on the title page is a guarantee that it is everything that could be desired.

A Practical Treatise on Urinary and Renal Diseases, including Urinary Deposits. Illustrated by numerous cases and engravings. By W. M. ROBERTS, M.D., F.R.C.P.L., Physician to the Manchester Royal Infirmary, &c. London: Walton and Maberly, 1865, Small 8vo. pp. 523.

DR. ROBERTS divides his work into three parts. The first is introductory and treats of the physical and chemical properties of the urine in health and disease, and of course includes urinary deposits. The author does not attempt to give an abstract even of the recently accumulated array of researches on the composition of the urine and the rate of excretion of its several ingredients. For these purely chemical and physiological materials, which can scarcely be said to possess much clinical value at present, he refers his readers to the treatises of Neubauer and Vogel, Parkes, Beale, Thudichum, and Hassall; he hopes, however, that nothing has been omitted from his pages, a knowledge of which possesses any interest for the actual practice of medicine.

This part of the book is concise but very complete. The physical properties and mode of examination of the urine are first described: then the chemical constituents and their variations; next Inorganic Deposits; and, lastly, Organic Deposits. The more important deposits are considered under the following heads:—naked-eye characters, micro-chemical characters, production and occurrence, clinical significance, and treatment. We would especially direct attention to the sections on Oxaluria, Hæmaturia, Albumen, and Sugar, as affording admirable summaries of the more recent knowledge of these morbid states of the urine. As regards oxaluria, Dr. Roberts quotes from Dr. Golding Bird, a description of the symptoms which accompany the disease, but questions whether there is any real *oxalic acid diathesis.* He says:—

"The patient often fixes on some derangement of the sexual function, generally, in these times, on spermatorrhœa, under the inspiration of unscrupulous publications too widely circulated among the curious public; or on heart disease, consumption, or gravel. The physician is able by means of physical examination to set aside

these more open delusions, but falls himself into a trap of his own ingenuity, and is only more elaborately wrong than his patient. He finds crystals of oxalate of lime in the urine, and persuades himself that he has discovered the first link in the chain of consequences. It may be much questioned (and I certainly see no necessity for such a supposition) whether there be any morbid condition antecedent to the plain symptoms of the case, namely, a nervous system upset, because overtasked, and a digestion deranged because mismanaged."

He gives his reasons for these remarks, viz. :—

1. Intense oxaluria may exist persistently without evoking the group of symptoms attributed to the oxalic diathesis.

2. This group of symptoms may exist in typical development without the occurrence of oxaluria.

3. The most varied morbid states co-exist with oxaluria.

The second part of the work, occupying 128 pages, is devoted to diseases of which the chief characteristic is an alteration of the urine. The diseases treated of are Diabetes insipidus, D. mellitus, Gravel and Calculus, and Chylous urine. Although the size of Dr. Roberts' book would scarcely allow of such amplified treatises on these diseases as we meet with in other works, yet we really do not find any point of importance omitted, and we think it of advantage not to have to wade through long statements of opinions which have been advanced and are stated simply for the purpose of being refuted. We would particularly call attention to the sections on Gravel and Calculus, especially those on the diagnosis of the species of urinary calculi within the bladder or kidney ; and in the preventive and solvent medical treatment of calculi.

As regards diagnosis we extract the following which we think particularly worthy of attention :—

"The most certain knowledge is gained when a person who has been in the habit of spontaneously voiding small concretions becomes afterwards the subject of stone. In such a case, the examination of the calculi previously passed (supposing them to have been preserved) throws a sure light on the nature of the one retained—provided the epoch at which the former were voided be not too remote, and the characters of the urine continue to correspond.

"In the absence of this kind of evidence, certain knowledge of the nature of the stone is rarely attainable ; but still, it is generally possible to indicate—from the character of the urine, the constitu-

tion of the patient, and the known relative frequency of the several species of stone—*with strong probability,* the species to which it belongs; and also (and with still greater certainty) some of the species to which it does *not* belong.

"With regard to the character of the urine, the most important indications are supplied by the nature of its reaction, and the character of the deposit which may be precipitated from it. The re-action of the urine may be (*a*) acid; (*b*) alkaline from fixed alkali; or (*c*) alkaline from carbonate of ammonia.

"(*a*). If the urine be *acid* the stone is almost sure to be uric acid or oxalate of lime, or a mixture of these two.* These two deposits alternate with each other so frequently, and at such short intervals, that, if the urine be free from a uric acid or an oxalate of lime sediment, there is nothing to indicate directly, which of the two species the stone belongs to. But, as uric acid is much more common than oxalate of lime, the probabilities are considerably in favour of the former.. If the urine, on cooling, deposit abundantly either uric acid or oxalate of lime, and *à fortiori*, if either of these deposits are found in the urine at the moment of emission, there is strong probability that the *surface* of the stone is of the same nature; but this gives no warrant of the composition of the deeper strata.

"Vesical calculi are usually more complex in their composition than renal calculi. . . . If the urine be acid, and the calculus of recent date, the probabilities are greatly increased that it is composed of uric acid alone. . .

"Persons of gouty disposition are more likely to be the subjects of uric acid, than of oxalate of lime calculi.

"*b.* If the urine be *alkaline from fixed alkali,* the stone will be composed either of bone-earth phosphate or carbonate of lime. Both are of extreme rarity.

"*c.* If the urine be *alkaline from carbonate of ammonia,* the composition of the nucleus and body of the calculus can no longer be divined; but its surface is sure to be composed of the mixed phosphates. The depth of this crust can only be conjectured from the intensity of the ammoniacal reaction, the quantity of pus and flakes which are discharged with the urine, and the length of time during which this state of urine has persisted. Care must be taken to ascertain if the urine be ammoniacal *at the moment of emission*; for in most cases of stone there is some degree of cystitis; and the presence of pus causes a urine which was passed acid, speedily to

* "Concretions of xanthine, fibrine, and fatty matters are altogether left out of consideration, on account of their extreme rarity. Cystine is also excessively rare; and if cystine crystals be not found in the deposit, it may practically, be likewise excluded."

become ammoniacal. The degree of the ammoniacal reaction is best judged of by the intensity of the ammoniacal odour, by the gelatinized, or loose, condition of the pus, and by the abundance of triple phosphate crystals. If the urine be only very feebly ammoniacal, or have only recently become ammoniacal, the phosphatic crust may be only a thin film. In the case of large or old phosphatic concretions, fragments of phosphatic *débris* are frequently voided with the urine. If the ammoniacal reaction of the urine is once established in a case of stone it seldom afterwards gives place to an acid reaction."

The third part is devoted to organic diseases of the kidneys; viz., congestion, or renal derangements which are occasioned rather by an undue determination of blood to or some mechanical obstruction to the return of blood from, the organs; Bright's disease, acute and chronic; suppuration in the kidney: renal embolism; pyelitis and pyonephrosis; concretions in the kidney; hydronephrosis; cysts and cystic degeneration of the kidneys; cancer, benign growths, tubercle of the kidneys; Entozoa, and anomalies of position, form, and number of the kidneys.

We had marked for extract several passages in the section on Chronic Bright's disease, but upon reconsideration we find we could not do justice to the completeness of Dr. Roberts' treatises by simply presenting our readers with short extracts from various parts of the text. We prefer, therefore, notwithstanding its length, to re-produce the following section:—

"URÆMIA.—Certain phenomena, chiefly affecting the nervo-muscular system, arising in the course of Bright's disease, have been attributed to a poisoned state of the blood, from the retention in it of excrementitious matters which the disabled kidneys are unable properly to eliminate. To these phenomena the term *uræmic* has been applied; they consist of twitchings and convulsions of the voluntary muscles, headache, drowsiness, coma, defects of sight and hearing, vomiting, and diarrhœa.

"It is a marked feature of uræmic phenomena that those which are of a paralytic nature affect the sensorium and the special senses, but not the voluntary muscles; while those of an opposite kind (exalted irritability) affect the voluntary muscles, but not the sensorium. Delirium is rare, while coma is frequent; paralysis of the limbs is scarcely known (unless there be some anatomical lesion of the brain superadded), while convulsions are frequent.

"The mode in which uræmic symptoms enter on the scene, and the forms they assume, present great diversity.

"Generally they begin insidiously with headache or vomiting, followed by heaviness, indifference, and somnolence. These premonitories may either pass away in a few days without further consequence, or they may be succeeded by general convulsions and coma. In other instances the patient is at once struck down with convulsions or insensibility without any previous warning, or he becomes suddenly blind, or is seized with uncontrollable vomiting.

"The most common of these symptoms is *headache*; few individuals with degenerated kidneys altogether escape it. A sense of heavy weight or compression is complained of over the forehead or vertex. Sometimes the pain is obstinately fixed at the back of the neck, or behind the orbits.

"The *defects of sight* consist either in a dimness of vision (amblyopia) which comes and goes—objects appearing as if veiled in mist; or in rapid and complete, though usually temporary, blindness. The convulsive seizures are often accompanied with temporary loss of sight, which generally persists in greater or less degree for a certain time after the spasms have passed away.

"The ophthalmoscope reveals no organic change in the eye in genuinely uræmic amblyopia; it is a purely cerebral phenomenon, and not to be confounded with the hæmorrhagic blindness (Retinitis apoplectica), which is also not uncommon in Bright's disease, and which is due, as V. Graëfe has shewn, to rupture of the retinal vessels. In this latter affection (which is in no sense uræmic) the loss of sight is seldom complete, but it is of a more permanent character. The production of it is probably due to the hypertrophy of the left ventricle which so commonly accompanies a contracting kidney, and the increased tension in the arterial system consequent thereupon; it is an occurrence of the same order as the sanguineous apoplexy to which the same individuals are liable.

"Uræmic *deafness* is much less common than amblyopia, and its occurrence is highly exceptional.

"Uræmic *convulsions* are of the epileptic type, and, as a rule, they conform strictly to that type—being accompanied with complete insensibility, rolling of the eyes, biting of the tongue, and foaming at the mouth. The paroxysm commonly leaves the patient deeply comatose.

"In exceptional instances consciousness is not wholly lost. In a lady under my care the paroxysms coincided with the catamenial periods; during the convulsions the patient knew the persons about her, and called loudly to be held fast. . . . .

"An attack of uræmic convulsions may consist of only a single paroxysm; more frequently there occur a succession of paroxysms or fits, following each other at uncertain intervals of a few minutes or several hours— the patient lying during the remissions in a state

of profound insensibility, with stertorous breathing, pale face, and dilated pupils; or in deep drowsiness, but capable of being partially roused, when spoken to or shaken.

"If a first attack does not prove fatal, it may recur at irregular intervals of weeks or months, or be re-placed by uræmic symptoms of some other order.

"Uræmic *coma* either creeps on very gradually, passing on, in the course of two or three days, into complete stupor; or it culminates quickly—the patient falling down, as if in apoplexy, perhaps while walking in the streets, or occupied with his usual avocations. Cases of this class, when there is no anasarca, and the previous state of the urine is unknown, are very liable to be confounded with apoplexy or with narcotic poisoning . . .

"The *diagnosis* of uræmic coma from apoplexy rests on the absence (in the former) of paralysis, and the partial recovery of consciousness between the convulsive attacks, if there be any. From poisoning by opium, renal coma is distinguished by the dilated or semi-dilated state of the pupils, and by the occurrence of remissions in the insensibility. From ordinary epilepsy the diagnosis—apart from the antecedent history, which, if known, suffices to indicate the nature of the case—is sometimes difficult. The incidents of the seizures are often identical, even to the existence of an aura. As a rule, uræmic fits want the turgid purplish countenance, and asphyxial character of true epilepsy—the face in uræmia being nearly always deadly pale and the breathing easy.

"Dr. Richardson relates the cases of two children poisoned by belladonna berries, in which the symptoms closely resembled uræmic coma, sequential to scarlatina. The insensibility was complete and the pupils strongly dilated. The examination of the vomited matters and of the urine furnishes, in such cases, the best means of diagnosis.

"In all cases of convulsions or insensibility from doubtful causes, the urine should be forthwith examined, and, if necessary, withdrawn by catheter for that purpose. It must not, of course, be forgotten, that sanguineous apoplexy is a not very unfrequent occurrence in chronic Bright's disease.

"Uræmic coma and convulsions may prevail separately; but much more commonly the attacks are of a mixed character, and combine several or all the phenomena just enumerated* . . .

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* It is worthy of remark that the uræmic symptoms in cholera almost always partake of the nature of coma. It is rarely that convulsions occur in the uræmia of cholera. We do not say they never happen, because we have seen a few cases, but only under circumstances when convulsions might be expected to occur independently of the uræmia, as in drunkards, and young children either teething or infested with worms. —Ed. *M. Q. J.*

"As a rule, both the quantity of urine and the excretion of urea diminish notably at the period immediately preceding a uræmic attack. Sometimes, however, very great scantiness of urine, or even total suppression (in acute Bright's disease) may exist without evoking any uræmic symptoms. . . .

"Uræmic *vomiting and diarrhœa* are common phenomena of Bright's disease. The vomiting which occurs in that disease is not, of course, always uræmic. The digestive functions are notably impaired throughout the complaint, and a heavy or indigestible meal may at any time be rejected as in dyspeptic states from other causes. When the vomiting is really uræmic, it takes place without reference to the nature of the contents of the stomach, and is oft repeated or uncontrollable; the vomited matter is a watery fluid, either distinctly ammoniacal to the smell, or (if acid) evolving ammonia freely when caustic potash is added thereto. The alvine dejections are similarly characterized when due to the same cause.

"*Paroxysms of dyspnœa* belong to the least frequent forms of uræmic disturbance—if indeed such attacks have at any time a genuine claim to the designation uræmic. Fournier cites some cases of this kind." * * * *

We have selected the above as an example of the thoroughness with which Dr. Roberts deals with the various subjects comprised in his work. We have omitted the details of cases which are incorporated with the text.

Our space will only permit of one more extract:—

"*General cystic degeneration of the kidneys in adults.*—This is a somewhat rare condition, though most museums contain specimens. There are two very fine examples in the collection of the Manchester Infirmary. In this form of disease the organs are greatly enlarged, so as sometimes to weigh several pounds, and to constitute tumours in the abdomen recognizable during life. Both kidneys are always affected; but not, generally, in an equal degree. The substance of the gland is converted into a mass of closely aggregated cysts, lodged in an abundant matrix of connective tissue. The cysts do not communicate with each other, nor with the calyces—except in rare cases, when some of them suppurate and open into the pelvis. They range in size from a pin's head to an orange, and have walls of varying thickness. Their contents also vary: some contain a limpid yellowish or reddish serum; others a gelatinous substance. The fluid within the cysts always contains albumen, but not urinous ingredients. The interior of the cyst is lined with epithelium; and sometimes blood discs, pus corpuscles, and cholesterine crystals are found within them. In far advanced cases the secreting tissue of the kidney is almost entirely destroyed; more frequently remnants of renal tissue are found in the fibrous

matrix between the cysts and in the pyramidal portions. The pelvis, ureter, and bladder are open and usually healthy. Two or more cysts may become confluent by absorption of some parts of their walls and then an irregular cavity is produced, with fibrous bands or fræna passing from side to side. Queckett attributed the formation of the cysts to dilatations of the Malpighian capsules; but the observations of Dr. Conway Evans, and Dr. Bristowe, on what appear to have been incipient cases, lead to the conclusion that they are formed, as in the congenital cases, by expansions of sections of the uriniferous tubes, and occlusion and atrophy of the intermediate portions. Independent sacs are thus constituted, which at first are so minute that they can only be seen with the microscope, but at a later period they enlarge into visible cysts."

In the museum of the Madras Medical College there is a very fine specimen of this cystic degeneration affecting both kidneys, which are enormously enlarged. The kidneys were presented by Dr. Hunter Adam, and were obtained from a prisoner in the Nellore Jail, who died comatose after a short illness.

We can confidently recommend Dr. Roberts' work as a treatise on which the greatest reliance may be placed, whether in regard to the accuracy and faithfulness of the descriptions of disease, or in respect of the judiciousness of the treatment recommended. It does the greatest credit to the Manchester School. The illustrative wood-cuts are faithful representations of urinary deposits, and the work is enriched by the details of numerous cases of the different diseases treated of in its pages. A modern Medical library could scarcely be considered complete if it wanted a copy of this work.

PART III.

MEDICAL MISCELLANY.

No. 9.—*Variola confluens; extensive sloughing; subsequent Pertussis; Abortion in the fourth month of pregnancy; Recovery.* Under the care of Surgeon W. N. CHIPPERFIELD, Ag. Physician, General Hospital. Reported by Assistant Apothecary H. STAGGS.

VATHA VULLEEAMAH, a Hindoo woman, about 20 years old, in her third month of pregnancy, was admitted into the General Hospital, Madras, on the evening of April 8th, 1867. She was in an extremely wretched condition. The friends, who accompanied her, stated that she was attacked with small-pox a fortnight ago, and, judging from the appearances present, she must have been sadly neglected. Being a caste woman, the prejudices of her race prevented her seeking medical advice at an earlier period, and it was not until her relatives believed that the case was quite a hopeless one that they brought her to hospital. The patient's body presented a superficial slough, only slightly broken here and there by thin lines of sound integument, from the forehead to the dorsum of the feet; there were several deep ulcers on her lower extremities, and one on the forehead, infested with maggots; while the natural odour of the disease combined with that due to the extensive sloughing, was sickening in the extreme. She was very feeble, scarcely able to articulate, and had a small, weak, fluttering pulse; she was quite prostrated from the want of rest and the irritation she was suffering.

The patient was placed in the north verandah of the shed attached to the hospital, specially devoted to contagious diseases, with screens so placed as to allow of thorough ventilation without exposure to any direct draughts. The following treatment was pursued:—

℞. Acidi Carbolici, ℥i.
Aquæ Ferventis, ℥xl.—M., ft. lotio.

When cold to be freely sprinkled over the body and clothing of the patient, several times a day.

℞. Ammoniæ Carbonatis, gr. 4.
Decocti Cinchonæ, ℥iss.—M.
ft. Haust.
to be taken every four hours.

℞. Tinct. Hyoscyami ʒii.
Aquæ Camphoræ, ℥i.—M., ft. haust,
to be taken at bed-time.

As much mutton or chicken broth as she can take; six ounces of wine daily in divided doses.

The maggots, which had burrowed deeply into the tissues, were destroyed by the injection of pure chloroform into the sinuses. Two or three injections were found sufficient for this purpose. [As a practical hint, it may not be out of place to mention here, that chloroform so used for the removal of maggots speedily proves successful, when other applications, such as turpentine, spirits of camphor, &c. fail].

Under the above treatment the patient rapidly and unexpectedly improved. She daily gained strength; the superficial sloughs separated (chiefly by disintegration and without any profuse suppuration); the ulcers healed, and she was progressing favourably, when (twenty days after admission) whooping cough supervened and proved very distressing to the patient, especially at night. She was at once removed to a ward, and the Extract of Belladonna was given in one-sixth of a grain dose every three or four hours; the dorsal region of the spine being rubbed night and morning with chloroform liniment. This treatment afforded very great relief, and the patient was in a fair way towards recovery when, during the night of the 15th of May, she was delivered of a four month's fœtus without having experienced any premonitory symptoms in the way of hæmorrhage or labour pains. The cause of abortion, as assigned by the patient, was fright from having seen some white object about the hospital grounds that night, which she persuaded herself to believe was a veritable ghost! No bad effects resulted from the abortion, and she convalesced rapidly. She was anxious to return home, but was kept in hospital partly on account of the cough of which she had a few paroxysms every night, and partly because the thick

epidermis of the palms of the hands and soles of the feet had died and was separating as a horny cast. She was very importunate to be discharged, and her friends came and begged that she might go, evidently for the purpose of performing some ceremony or vow, but she was recommended to remain until quite well. However, on the 24th of May, she was secretly removed from hospital by her relatives.

No. 10.—*Chronic Gastritis: Anasarca: Death from Perforating Ulcer of the Stomach.* By Surgeon W. N. Chipperfield, Acting Physician, General Hospital.

A. O., a German, Ship's Carpenter, aged 45 years.

An emaciated man of nervo-sanguine temperament, admitted 30th April 1867. States that he left England about twelve months since and was well until within the last three and a half months, when he began to suffer from severe pain in the epigastrium with a sense of oppression in the chest and difficulty of breathing. Soon afterwards dropsy of the legs set in and he became too ill to do his duty. On reaching Madras he was at once sent to Hospital.

Present state.—Extremely debilitated, cannot walk without support; very anæmic, conjunctiva pale, complexion muddy-coloured; expression of countenance very anxious and indicative of intense suffering. Lower extremities, from the middle of thigh downwards, enormously swollen and pit deeply on firm pressure. Has much dyspnœa amounting to orthopnœa, so that he cannot lie down, but sits upon the edge of the bed with his forehead supported upon the back of a high chair. Inspirations very shallow. Very severe pain in the precordial and epigastric regions, where there is exquisite tenderness on the slightest pressure. On percussing the thorax (performed with difficulty on account of its occasioning distress) there is universal dulness both before and behind, somewhat more marked on the right side. A very imperfect auscultation detects harsh tubular breathing at apex of left lung, and the heart's sounds are so plainly heard in the right lung that they completely mask the pulmonary sounds. The heart's action is excited and irregular; no abnormal murmurs. Pulse 110, small, feeble, irregular. Tongue furred. Bowels very irregular, lately constipated, the

stools passed with difficulty. Urine scanty, of pale straw-colour, *sp. gr.* 1010, reaction acid, contains albumen, $\frac{1}{8}$th.

Apply sinapism over heart and stomach.
℞. Olei Ricini., ℥i. directly.
℞. Tinct. Hyoscyami, ʒii.
Mist. Camphoræ, ℥i. at bed time.

To have broth and brandy-flip in small quantities.

May 1st.—No improvement, had very little sleep, partly from the pain, but chiefly from the distress in breathing. Bowels opened once, stool very solid. The pain is very acute, causing him to moan constantly; the abdominal tenderness is so great that he flinches at the approach of the hand. Pulse much accelerated, very small, irregular and feeble.

℞. Opii gr. i. every four hours.

2nd.—Is evidently sinking. The pain is not so much complained of, as he is drowsy and disinclined to talk. The objective symptoms are as before. Urine only a few ounces, opalescent but quite free from deposit. Albumen about one-eighth.

Omit the opium, continue the nourishment.

3rd.—Passed a very restless night; complains of great pain over *the heart.* Dyspnœa urgent. Was propped up on his cot last night, but finds the sitting posture more endurable. Pulse almost imperceptible, a mere weak fluttering thread. Begged for a purgative this morning as he felt sure a copious evacuation from the bowels would relieve him. Had thirty grains of jalap in syrup.

Begs for something to relieve "the pain at the heart."

Apply opiate epithem, continue brandy-flip.

Vesperi.—Sinking, semi-comatose. Respiration very shallow and rapid.

4th.—Died at 1 A. M.

Necroscopy *at* 8 A. M.—*Body* very much emaciated, some suggillations on sides and back of trunk. Lower limbs very anasarcous. *Head* not examined.

Thorax.—Pleura universally adherent except a small portion at apex of left lung. *Lungs* very œdematous; right, of dark-gray hue, vesicular structure not apparent, non-crepitant, looks like very much soddened wash-leather; left, of same appearance at lower lobe, but crepitant in upper lobe where the texture is more natural, but still œdematous.

Pericardium of natural appearance, cavity contains three ounces of clear serum. *Heart*, of normal size, and firm texture. The walls of left ventricle thicker than natural. All the cavities filled with firm bulky clots, those in the auricles of dark purple hue, but those in the ventricles composed of yellowish fibrine, adherent to the irregualities of the chambers and sending prolongations for some distance into the aorta and pulmonary artery. No valvular disease whatever.

Abdomen.—*Liver* large, somewhat pale, slightly nutmeggy on section. Under surface of left lobe covered with a pultaceous matter. *Stomach* and small omentum covered with a similar material. Upon sponging this away, some flakes of shreddy fibrine are seen on the surface, and on raising the stomach, a small circular perforation is found near the œsophagus, on posterior surface, just below the lesser curvature. Some of the contents of the stomach had escaped from this aperture, forming the pultaceous matter there noticed. No evidence of any active peritonitis exist. Upon opening the stomach, which is somewhat contracted, an oval ulcer is found, the centre of which is perforated, the opening having an area about equal to that of a split pea. The edges of the ulcer are pale, indurated and raised. The nucous membrane is pale, rugous, and covered with thick mucus and the matters taken before death.

Spleen natural.—*Intestines* natural but contracted.

Kidneys.—Rather pale and flabby, otherwise natural.

Remarks.—Although peritonitis from perforation appeared to be a likely cause of this man's sufferings upon admission, yet the complication of the condition of the lungs, the great amount of anasarca, and the albuminous urine, rendered the diagnosis extremely difficult; the prognosis being the only certainty about the case. I regret that a more perfect history could not be obtained, but the man never mentioned the occurrence of hæmorrhage either by vomiting or by stool, and the question was omitted to be put to him;—in fact, his distress was so great that one hesitated to add to it by causing any lengthened statement to be made. Of course the immediate cause of death was the formation and presence of the clots in the heart; but had there not been a perforating ulcer of the stomach, the condition of the lungs was such that life could not have been supported many hours. The stomach is in the Medical College Museum.

No. 11.—*Acute Arsenical Poisoning; Recovery.*—By Assistant Surgeon F. DUCKWORTH, M.D., Acting Civil Surgeon, Tranquebar.

(Communicated by the Inspector-General, Indian Medical Department.)

J. S., Æt. 53 years, Inspector Mofussil Police, 34 years service, 33 years in India. Temperament sanguine.

6th May, 1867.—Between the hours of 11 A.M. and 12 noon, I was hastily called to see Mr. S. at his quarters. It was said that he had been suddenly seized with violent sickness. I found him dressed for the purpose of repairing to the Sub-Magistrate's Court, where an important case of *aiding and abetting* escape of prisoners from jail was undergoing investigation, and in which three influential native jail officials were seriously implicated.

Mr. S. was late for breakfast, and was therefore hungry, and partook freely of chicken curry and rice, and drank some cold tea, as was his custom. The curry tasted bad and nauseated him whilst eating, and this induced him to drink some of the tea, but it only made him worse, and within five minutes he vomited three times. On my arrival I found him seated on a chair and vomiting incessantly into a basin. I removed his coat and tie, and promoted emesis by copious draughts of lukewarm water, until the stomach was thoroughly cleared and the water came out quite clean. The patient became very faint and prostrate, and he was therefore undressed and put to bed, and warm spiced brandy and water administered with the view of rousing him and of sustaining the circulation which was flagging. The brandy was rejected. The stomach was again cleared out several times by diluents. He felt a burning pain in the epigastrium and along the course of the œsophagus, and a strong metallic taste in the mouth, described as coppery. Cold sweats broke out profusely over the surface of the body, the countenance became dusky, the respiration hurried, and the voice weak and husky, whilst the pulse was small and scarcely perceptible. The temperature of the body rapidly fell, and this was succeeded by violent and increasing cramps in the calves, and both the upper and lower extremities became rigid and painful with spasms. Soon after, the whole of the muscles of the body suffered excruciating spasms, and the patient was in great agony and expressed himself as if dissolution were at

hand. All these symptoms were fully developed in three hours' time.

The stomach continuing highly irritable and rejecting everything that was administered either as antidotes or as stimulants, in order to keep up the circulation, frictions with turpentine and sinapisms were freely employed. The bowels were moved once only, but not purged. The intellect remained perfectly clear, though he was evidently very apprehensive and much agitated and troubled about his family who were absent from him. In this agonized state he resolved to give, and succeeded in giving, his deposition to the Native Magistrate regarding his case and the suspicions he entertained of the diabolical attempt upon his life. At this stage, a few doses of chlorodyne assuaged the irritability of the stomach, and allayed the violent spasms of the muscles.

By the evening (5 P.M.) the spasms abated in violence and frequency, but vomiting continued at intervals.

6. P.M.—Slept a little and awoke somewhat refreshed, but very thirsty and anxious for cold water. Some arrowroot conjee was given cold, and retained. The pulse gradually rose, and the skin was not so cold or damp, Urine suppressed since morning.

Chemical analysis of the suspected fluids.—Some white powder which was taken from the tea used by the patient, and suspected of being either Tartar Emetic or Arsenic, was dissolved in rain-water, and a little of it put into two separate clean test tubes. To the first was added a solution of ammonio-nitrate of silver, which immediately tinged it yellow, and a precipitate of a yellow colour gradually formed. To the second was added a solution of ammonio-sulphate of copper, which threw down a green precipitate, The suspected tea was next put into two tubes and tested, in the manner above described, with the ammonio-nitrate of silver and the ammonio-sulphate of copper respectively, when the characteristic precipitates of the arsenite of silver and the arsenite of copper were obtained ; proving beyond a doubt that the poison used was *white arsenic.*

The bright yellow precipitate from the tea gradually grew darker, from, evidently, the admixture of tannate of silver, which must also have been in solution. The experiment with the tea was repeated next day in presenee of the Assistant Superintendent of Police. The *suspected tea* was placed

in one tube and some *fresh plain tea* in another tube. To both was added a solution of the ammonio-nitrate of silver, when the *suspected tea* threw down a bright yellow precipitate of the arsenite of silver which slowly became darkened, from the cause already alluded to. And the *good tea* gave a dark—nearly black—precipitate of the tannate of silver.

Some of the *suspected curry and rice* was given to a full-grown healthy dog, and violent sickness, salivation, and vomiting ensued in ten minutes times, but the dog recovered from its effects within twenty-four hours and is now alive. Some of the *suspected tea* was given to a kitten, which made it sick in a few minutes and the kitten died in about six hours.

7th May, 1867.—The patient slept well. Complains of headache, a bad taste in mouth and soreness in epigastrium and throat, no cramps since last evening, though the limbs feel stiff and painful. Bowels confined. Urine still suppressed.

℞. Olei Ricini ℥i.
Aquæ Menthæ ℥ii.—*M.*
To be taken directly.

8th.—The oil was rejected after a few minutes, and the patient has since been much nauseated and sick, vomiting occasionally. Is restless and nervous. Pulse small and weak; skin warmer; passed some bright-coloured urine about 4 P.M. yesterday; felt some cramps in the calves only, relieved by dry friction. No appetite. Took arrowroot conjee at intervals and some chicken broth at noon yesterday.

℞. Rhei Rad. Contrit. gr. 40.
Magnes. Carbon. gr. 20.
Sodæ Carbon. gr. 5.
Aquæ Cinnamoni ℥ii.—*M.*
To be taken directly.

Vesperi.—Bowels have acted several times and dejections were very dark-coloured, offensive and bilious; skin is getting hot and the pulse quickened; headache and feeling of deep pain in vertex.

Apply cold evaporating lotion to head.
To be watched.

9th.—Slept badly the early part of the night, and about

2 A.M. he became very nervous, agitated and delirious, suspecting people were about the house plotting against his life. Jumps out of bed suddenly and runs after imaginary objects and stares widely and suspiciously around him, and at every one who makes the slightest noise or stirs. Is incoherent: head hot; no throbbing in temples; pulse quick and soft.

Continue cold evaporating lotion to head.

℞. Tinct. Opii, ʒss.
Mist. Camphoræ, ℥iss.—*M.*

This draught composed him and procured sleep in a short time, and he awoke this morning about 7, more calm and collected and free from incoherence, though still very timid and nervous. He speaks about some unaccountable dread that he feels. Is suspicious of the natives about him without cause, but is reassured by a little reasoning with him. Head not hot; pulse quiet.

Omit Lotion.

10th.—Passed a better night. Is free from delirium, but continues very nervous and suspicious. Removed into the adjoining house which was untenanted, and seems quieted in some of his apprehensions and dread of inpending danger. Complains only of sore mouth and pain on pressure in epigastrium. Bowels opened last evening; stools very offensive and bilious. Urine light-coloured and more copious. Skin cool.

Alum Gargle.

Diet:—Arrowroot and rolong conjee, broths and jelly.

N.B.—On the evening of the 9th instant, at the request of the Magistrate, I directed the recovery of the buried rice and curry, and tested each separately. The rice and curry and some of the sand in contact with them were separately washed with care and the fluid strained through thin cloth. To the solutions thus obtained I applied the ammonio-nitrate of silver test, and then allowed the two tubes to stand all night undisturbed. Next morning I found distinct traces of the yellow precipitate and colouration of arsenite of silver in the solution obtained by the washing of the meat and curry; but none whatever in that from the buried rice.

11th.—Slept well, and is quite rational and composed this morning. Less soreness in epigastrium, course of œsophagus and mucous membrance of mouth. Eyes a little inflamed and painful. Urine more copious. Bowels not opened since last report.

Alum Gargle.

Draught at bed-time, if required.

12th.—Did not sleep quite so well last night. Took no sleeping draught. Feels hungry this morning; has already taken some arrowroot conjee. Still a slight coppery taste in middle of tongue; the organ is foul in the centre, red and excoriated at tip and margins. The mucous membrane of the cheeks and the gums are also sore. Eyes less inflamed, no headache, but a feeling of light-headedness. Cannot stand up for any time. Bowels confined. Skin cool and perspiring in a healthy manner. Pulse 80, soft and regular.

℞. Pil. Rhei Comp. gr. 10.

In Pil. ii. at bed-time.

13th.—Is improving in every respect. Bowels moved twice by the rhubarb pills. Appetite returning. Is still very weak.

Nihil.

15th.—Is gaining strength slowly. No complaints. Appetite returning.

17th.—Marked and steady improvement. No pain or uneasiness in head. Tongue clean. Pulse good. Skin and other functions performed naturally. Appetite much improved.

Is recommended for leave for the benefit of his health as he will not be fit for duty for some months to come.

22nd.—Has obtained three months privilege leave from his own department. I consider him sufficiently recovered to travel to Bangalore or the Hills by railway.

Discharged from sick report.

No. 106.

"MADRAS, 21st May 1867.

"*From S. J. Wyndowe, Esq, M.D.*, Chemical Examiner,
"To F. Duckworth, Esq., M.D., Acting Civil Surgeon, Tranquebar.

"Sir,—In acknowledging the receipt of your letter No. 19, dated 8th May 1867, I have the honour to report as follows:—

"The box reached me by Banghy with seals intact. It contained, No. I, a small sealed phial, labelled 'Suspected poison in solution.' There was about one ounce of a clear fluid in the phial; in this I detected the presence of arsenic in small quantity. No. II; a phial sealed, labelled 'Poisoned tea,' containing about 3 to 4 ounces of a weak infusion of tea; in this I found arsenic to be present in large quantity."

* * * *

No. 12.—*The Alkaloids of Chinchona.*

Proceedings of the Madras Government, Revenue Department, 19th March 1867.

Read the following papers:—

From the President and Members of the Chinchona Commission, to the Secretary to Government, Revenue Department, Fort Saint George, dated Madras, 28th February 1867.

1. With reference to the Order of Government, as per margin, we have the honour to report that the printing of the tabulated results of the experimental use of Chinchona Alkaloids has occasioned some delay in the submission of a progress report. A considerable number of the tables, however, have now been printed, so as to enable us to estimate, with tolerable precision, the therapeutical effects of the several alkaloids; and, as our President will have no other opportunity of recording his views as to the usefulness of these medicines, the Members of the Commission have decided to conclude now a preliminary report of their proceedings, leaving their more detailed observations to follow when the results of the experiments still in progress are more fully known.

No. 764 of 28th March 1866.

2. In the Tabular Statements, already printed and laid before the Commission, minute particulars in regard to 1,145 cases of paroxysmal fevers treated either by Chinonine, Chinchonidine, or Quinidine, have been registered. These fevers have occurred mostly at stations notedly malarious, such as at Goodaloor in the Wynaad; Sumblepoor and Russelcondah in the Northern Circars; the Godavery jungles; Mysore, Cochin, and Labuan, and may, therefore, be regarded as fair average types of the forms of paroxysmal fever to be met with in the malarious districts of Southern India.

3. A larger number of cases have been treated up to date, but the Returns have not yet been received, or, if received, are not out of the printer's hands, so that the results must be considered in detail hereafter.

4. With regard to the 1,145 cases of fever referred to,

it will suffice to note that they were treated by the alkaloids, as follows:—

By Sulphate of	Chinchonine	410
Do.	Chinchonidine	359
Do.	Quinidine	376

The doses and mode of administration varied a good deal. Some Medical Officers used large doses of from 15 to 20 grains; others, medium doses of from 8 to 10 grains, and some small doses of from 2 to 5 grains. As a general rule, the Members of the Commission are of opinion that the experiments were most successful when medium doses were employed, that is, the cases of fever in which 8 or 10 grains of alkaloid were administered in a single dose daily, appeared to recover more expeditiously than where larger or smaller quantities were employed. Large doses of Chinchonine, Chinchonidine, and Quinidine produce effects very similar to those of Quinine. Disagreeable noises in the head, singing in the ears, deafness, and giddiness are the more noticeable of the symptoms produced by all of the Chinchona alkaloids. Vomiting, nausea, and purging also are occasionally noted to follow their use. On the other hand, small or moderate doses produce none of these peculiar effects, while they improve the appetite, strengthen the digestion, and, in many cases, appear to have a marked effect in reducing the size of congested spleens.

5. The alkaloids were exhibited successfully, that is, with the result of a rapid cessation of febrile paroxysms in a very large proportion of the cases. Out of the 1,145 cases recorded, four deaths occurred, and all these took place at Goodaloor, in Wynaad. Dr. Keess observes of them, that the fever was complicated either with Pneumonia or Diarrhœa, and that a great proportion of his patients were half-starved, emaciated persons, completely prostrated by the malarious influences surrounding them.

In addition to the cases ending fatally, it is recorded that the alkaloids failed more or less to arrest febrile paroxysms in twenty-seven persons—a proportion a little in excess of two per cent. of the total cases treated.

6. In regard to these failures, it must be noted that they occurred chiefly in the practise of gentlemen who tried the alkaloids, not in recent attacks of fever, but in patients whose systems were chronically poisoned by malaria. Thus,

Mr. Walter, of the 4th Regiment N. I., Secunderabad, records of many of his cases, that they had been from one to three or four months suffering from fever before he used the alkaloids, and that in some of them Quinine failed just as much as Quinidine, Chinchonine, or Chinchonidine had done. Mr. Chipperfield explains the probable cause of failure in his Report (Appendix III). In recent attacks of uncomplicated paroxysmal fever, the new alkaloids appeared to most of the Medical Officers using them, and to the Members of the Commission, to be quite as efficacious in the curing of fevers, as Quinine. On this subject, however, it is impossible to speak with precision, until the results of treatment with the chemically pure di-sulphate of Quinine, as supplied by Messrs. Howards, have been tabulated in the form used for recording the treatment by the other alkaloids. Instructions have been issued to the gentlemen engaged in the experiment to do this, and the returns, when received, will afford most valuable data whereby to compare the relative therapeutical effects of the several alkaloids.

7. The evidence, so far as it has come before the Commission, does not go to shew any particular superiority of one alkaloid over another.

The Sulphate of Quinidine is, perhaps, the one regarding which there is the least difference of opinion as to its merits. All three are undoubtedly anti-periodic, and capable of controlling paroxysmal fevers, the Sulphate of Chinchonine in *large* doses perhaps causes more unpleasant symptoms than the others; but on this point further evidence is still wanting to enable the Commission to offer a positive opinion. As regards the general and practical question at issue, we agree with Dr. Keess in thinking that all three alkaloids are, equally with Quinine, capable of controlling paroxysmal fevers. Dr. Keess' experience led him to conclude that a 10-grain dose of either salt, would check or postpone the febrile paroxysm in a considerable number of cases, while very few patients required more than a second 10-grain dose to subdue the disease for the time being.

Other observers have employed larger quantities of the several drugs; but it is by no means clear to the Commission, that the quantities exhibited were, in all cases, necessary to check the fever. As regards this part of the inquiry,

it is intended to institute a distinct series of experiments for the more accurate comparison of the value of the several alkaloids, when contrasted with Quinine, or with each other.

8. The main conclusion which the Members of the Commission have derived from the data before them, is that the alkaloids hitherto but little valued in medicine, are scarcely, if at all, inferior as therapeutical agents to Quinine.

What the exact differences may be in their physiological and therapeutical action, is a question the answering of which may fitly be deferred until more data have been collected in reference to the new alkaloids. The differences, however, will most likely be found to be of degree, rather than of kind, and practically, so far as the wants of India are concerned, it will be just as well that the locally grown barks yield a large proportion of one alkaloid as of another.

9. So impressed are we of the value of these hitherto despised alkaloids, that the Members of the Commission are unanimous in considering that, in the public service of this country, they may very advantageously be substituted in part for Quinine. If three pounds of Chinchonine can be obtained at the price of one pound of Quinine, we consider that a great public good would result from the purchase of the larger quantity, as it would enable the Officers of the Medical Department to benefit a much larger number of the population than they can now afford to treat by prescribing Quinine. Arrangements will be made by Dr. Mackenzie to include in the next Medical Indent on the Home Government a requisition for suitable quantities of each alkaloid.

10. We beg to direct attention to the tables, &c. in the Appendix. It gives us much pleasure in testifying that the experiments conducted by Dr. Keess at Goodaloor have been most carefully recorded.

11. Mr.. Cornish, Secretary to the Principal Inspector General, in addition to his other duties, voluntarily undertook those of Secretary to the Commission. For the mode in which these duties have been carried out, the Members of the Commission feel that their best acknowledgments are due to that gentleman.

APPENDIX I.

TABLE 1.—*Shewing the results of treatment of paroxysmal fevers by Chinchonine.*

	Name of Medical Officer.	District.	Type of Fever. Quotidian.	Tertian.	Remittent.	Results. Cured.	Failed.	Remarks.
1	Dr. Keess and Mr. Wade.	Goodaloor (Wynaad) ..	170	19	1	188	2*	Large doses produced disagreeable effect; usual dose from 5 to 10 grains daily. Dr. Keess considers the remedy equal to Quinine.
2	,, Foy...	Sumbulpore... ...	31	6	1	38	...	Chiefly 5-grain doses from two to three times daily.
3	,, Cleveland..	Mysore.	38	4	2	43	1†	Dose grains v—xx three times a day. Chinchonism resulted when large doses were given.
4	,, Whitton....	Cochin...........	25	3	...	28	...	Single dose of 10 grains in a few. In most 5 grains before expected paroxysm. Remedy appeared to effect rapid reduction of size of spleen in several cases.
5	,, White, 1st Royals..	Kamptee...	6	...	...	6	...	Small doses of 2 or 3 grains used. Had larger doses been given, the cure would have been more rapid.
6	,, Dougall.....	Northern Circars.	14	2	...	16	...	Given in v, x, and xv grain doses.
7	,, Chipperfield	Madras	8	2	1 Contd.	8	3	In unsuccessful cases the remedy was not continued more than two days, small doses only given.
8	,, Heard	Shemogah, Mysore	2	...	...	2	...	
9	,, Walter.. ...	Secunderbad	18	3	...	17	4	Nearly all Dr. Walter's cases had been a long time under other treatment before Chinchonine was resorted to. They were obstinate intermittents, and did not yield readily to treatment. Many of the cases had "burning of the hands and feet."
10	,, Fitzgerald..	Labuan	14	5	...	19	...	Small doses used which rendered treatment protracted.
11	,, Houston.....	Upper Godavery.	35	...	...	35	...	Chinchonism resulted when repeated large doses were used. Dr. Houston notes that, in the majority of cases, the pulse rose soon after taking a dose of the medicine.
		Total...	361	44	5	400	10	
			410			410		

* Both died from exhaustion.

† Complicated with pneumonia—the remedy was discontinued.

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TABLE 2.—*Shewing the results of treatment of paroxysmal fevers by Chinchonidine.*

	Name of Medical Officer.	District.	Type of Fever. Quotidian.	Type of Fever. Tertian.	Type of Fever. Remittent.	Results. Cured.	Results. Failed.	Remarks.
1	Dr. Keess and Mr. Wade.	Goodaloor.........	137	16	1	154	...	These cases were nearly all cured by from one to two doses of 8 or 10 grains.
2	,, Foy.......	Sumbulpore... ...	36	5	...	39	2	In the cases of failure Quinine was restored to, but the result is not stated—generally used in 5-grain doses.
3	,, Cleveland..	Mysore......... ...	24	10	4	38	...	Doses varied from v to xx grains—small doses in a few cases with less immediate effect.
4	,, Whitton ..	Cochin.......	28	4	...	31	1*	
5	,, White, 1st Royals...	Kamptee	...	...	...	...	..	
6	,, Dougall. ...	Northern Circars.	12	3	...	15	...	Given in v, x; and xv grain doses, considered by Dr. Dougall quite equal to Quinine.
7	,, Chipperfield	Madras......... ...	8	3	1	7	5	Three of the unsuccessful cases were only one day under treatment. See Dr. Chipperfield's remarks in Appendix III.
8	,, Heard... ...	Shemogah, Mysore	11	...	...	10	1	Grains 8 to 10 before paroxysm.
9	,, Walter.. ...	Secunderabad ...	7	1	...	5	3	As regards three cases the results are so vaguely given, that it cannot be said whether the remedy failed or not.
10	,, Fitzgerald..	Labuan......	18	4	...	22	...	Grains 3, 6, 8, before paroxysm.
11	,, Houston...	Upper Godavery.	25	1	...	25	1†	
		Total...	306	47	6	346	13	Three doubtful.
			359			359		

* Fever became remittent.
† Complicated with Neuralgia and Paralysis.

TABLE 3.—*Shewing the results of treatment of paroxysmal fevers by Quinidine.*

	Name of Medical Officer.	District.	Type of Fever. Quotidian.	Tertain.	Remittent.	Results. Cured.	Failled.	Remarks.
1	Dr. Keess and Mr. Wade.	Goodaloor... ...	140	11	2	151	2	Both died, one from exhaustion, one dysentery.
2	,, Foy	Sumbulpore ...	37	6	..	42	1	Chiefly 5-grain doses, three times a day.
3	,, Cleveland	Mysore...	28	5	..	33	...	2 cases result not known. From 2 to 20 grain doses 3 times daily.
4	,, Whitton	Cochin	26	3	..	29	...	Chiefly 5-grain doses. In a few cases 10 grains.
5	,, White, 1st Royals ..	Kamptee.	9	...	...	9	...	3 and 5-grain doses, three times daily.
6	,, Dougall	Northern Circars...	11	4	...	14	1*	5, 12, and 15 grain doses.
7	,, Chipperfield	Madras...	8	..	...	8	...	5-grain doses, thrice daily.
8	,, Heard...	Shemogah, Mysore.	12	..	2	12	2†	Doses 2, 4, 5, and 6 grains.
9	,, Walter	Secunderabad ...	15	1	...	14	2	Some of the cases were successfully treated, hypodermically. The two failures cured by Quinine.
10	,, Fitzgerald...	Labuan...	9	1	...	10	...	6-grain doses.
11	,, Houston	Upper Godavery ...	10	1	1	12	...	Grains v to x, twice a day.
12	,, Henderson...	Bangalore	15	..	...	12	3‡	
13	,, Oswald	Do....	17	2	...	19	...	Grains v to x, chiefly in interval of fever.
		Total ..	337	34	5	365	11	
			376			376		

* In this case paroxysm only mitigated not checked.
† These were cases of remittent fever, and remained under treatment though benefited.
‡ Remedy omitted on account of diarrhœa.

APPENDIX II.

Report on the Chinchona Alkaloids.

1. In obedience to instructions received from the Head of the Medical Department, I proceeded to Goodaloor, south-east Wynaad, and started the alkaloids experiment on the 1st June 1866.

2. When I arrived at Goodaloor, fever was prevailing to a great extent, both there and in the adjoining coffee estates. Owing to the great rush of fever subjects to the Dispensary, I decided on first observing the effects of large doses of the alkaloids.

3. As there were many persons suffering from fever in June, the administration of a single large dose enabled me to take up a larger number of cases, than I would have been able to do, had I begun with small and repeated doses.

4. I first tried Chinchonidine, in doses varying from 10 to 15 grains, and, in a few days, I was pleased to find that it acted as Quinine would have done in similar doses.

5. I next tried Quinidine with similar results.

6. I left Chinchonine to the last, as it was said to be an irritant of the gastro-intestinal mucous surface. I was, however, agreeably disappointed, when I found that it did not cause nausea or vomiting in doses of 10 grains, and that it was as good an anti-periodic as the sister alkaloids.

7. Encouraged by the absence of symptoms indicating gastro-intestinal irritation, I used Chinchonine in fever complicated with diarrhœa, and I am satisfied that it is not an irritant of the stomach or bowels any more than Quinine is, in certain cases.

8. Some of my patients were *out* and *in*-patients of the Goodaloor Dispensary. Others were visited in the bazaar, and in the adjoining coffee estates, from two to six miles distant from Goodaloor.

9. The great majority of my patients were half-starved, emaciated persons, with flabby muscles, dry, dirty, and shrivelled skins, large spleens, bloodless eyes and tongue,

and small atonic pulse. In many of them, languor was so marked that they could, with difficulty, muster up energy enough to reply to questions; and so prostrated were some of them, that they were, with difficulty, induced to take the medicines offered to them.

10. I have not attempted to reduce, to a small compass, the results set forth in the tabular reports, as I hear that this work has been undertaken by the Chinchona Commission; but I beg leave to point out that a 10-grain dose, of all three alkaloids, seemed sufficient to check the return of fever in the majority of cases. Where it failed to check the return of fever, the succeeding paroxysm was generally observed to be less severe. When the paroxysms returned with unabated severity, 15 grains, and then 20 grains were tried. In a few severe cases, I administered, at the onset, 15 or 20 grains.

11. During the four months that I was employed in the Wynaad, 467 cases were treated with the alkaloids. The majority of these were cases of the quotidian type. Bronchitis, congestion of lungs, pneumonia, diarrhœa, dysentery, and anasarca were occasional complications. I may as well add, that these complications did not in the least interfere with the administration of the alkaloids. Where the local affection required special attention, the alkaloids were given with remedies suitable to the complication. I may here add that all three alkaloids appeared to be as efficacious as quinine.

* * * *

(Signed) J. KEESS, M.D., Asst. Surgeon,
Late on special duty in the Wynaad.

MADRAS, *25th February* 1867.

APPENDIX III.

Report on the therapeutic effects of the Salts of the Chinchona Alkaloids.

1. In furnishing the accompanying tabular reports of the therapeutic effects of the Chinchona Alkaloids, as tested at the General Hospital, Madras, I have the honour to state, that in order to draw a more accurate comparison between the salts tested and the Sulphate of Quinine, I exhibited the

former in the same way as I am in the habit of using the latter, viz., I gave the first dose upon the decline of the sweating stage, the second and third doses being given at two-hour intervals. The fourth dose was exhibited at the same hour as the first dose, and so on with the fifth, sixth, and any subsequent doses which appeared to be required.

2. I have been led to form a high estimate of the anti-periodic effects of the Sulphate of Quinidine. This salt was successful in the cure of the eight cases in which it was administered, and it appeared to me to be quite as valuable a remedy as the di-sulphate of Quinine itself. In some respects it seemed superior to Quinine, as in no instance did it produce any of the disagreeable effects termed Chinchonism; in fact, two patients, who were suffering from severe headache, stated that the medicine completely relieved this symptom. I did not observe any injurious effects upon the digestive organs, but rather a favourable action, as appetite was promoted and digestion apparently assisted. In seven cases the Quinidine was given in doses of five grains thrice daily. As these doses were effectual, I continued them. But as a matter of experiment, in case 8, I gave on the 11th of June, one dose of 15 grains on the decline of the sweating stage, and a second dose of 8 grains two hours before the next expected paroxysm. The patient was free from fever for five days, when a relapse occurred. The same plan of administration was followed and with success, for there was no further paroxysm of ague, although the patient remained under observation for Incipient Phthisis, for a period of more than a month.

3. The Sulphate of Chinchonine I would place second on the list as an anti-periodic. It was unsuccessful in three out of eleven cases; but two of these were very unfavourable ones. One, a European Coffee Planter, was suffering from Tænia and general abdominal engorgement, and the remedy could not be pushed in his case, as it produced Chinchonism very rapidly. He had taken a large quantity of Quinine before the Chinchonine was commenced. He was subsequently treated with pernitrate of iron, Kuosso, turpentine, and oil of Male Fern, but he did not pass the head or neck of the Tænia, only a few proglottides. I saw him on September 17th very much improved in health, getting strong and stout, and quite free from fever. The second case, a European (Surgeon of the Ship "Blackwall,") was a relapse.

Three weeks previously he had been cured of an intermittent by Quinidine. (Case 7 in the table.) He was then suffering from Chronic Hepatitis, and had threatenings of Hemiplegia. These symptoms quite disappeared before his first discharge from Hospital on the 19th June. On his second admission it was ascertained that he had been much exposed to the sun, going fowards and backwards among the shipping in the roads. The Chinchonine* failed to arrest the paroxysms of ague, which was subsequently effected by Quinine.

4. The third unsuccessful case was that of a Eurasian lad, whose stomach would not tolerate the remedy. He was subsequently cured by a combination of Diaphoretics with Quinine.

5. Gastric disturbance was produced by the Chinchonine in most of the successful cases.

6. The Sulphate of Chinchonidine appears to me a much inferior anti-periodic to Quinine. It was unsuccessful in five out of twelve cases in which it was employed. I allowed myself to be somewhat prejudiced against the salt when I commenced its use, as it almost always produced nausea.

7. In cases 1, 8, and 9, it was decidedly successful. Case 2 might be removed from the table; the man was saturated with malaria, and had previously been treated by Quinine and by Chinchonine.

8. Case 3 was a complicated one; the woman was the subject of Hysteria, and each cold stage was accompanied by violent hysterical fits. Her spleen was much enlarged, and, altogether, it was a most unfavourable case for even Quinine. Deobstruents were freely used, even whilst taking the Chinchonidine. She is entered as having been successfully treated by the Chinchonine (Case No. 10 in the table). The fact is, there had been no paroxysm for two or three days whilst taking the Chinchonine, and as that salt was exhausted, she simply passed to the Chinchonidine. She has since had relapses, and has been treated by Quinine and Deobstruents. She was discharged at her own request

* Only ʒss. given.

on the 31st August, but since then has had a relapse and has again come under treatment.

9. Case 4 might be removed from the table; he had only one dose of Chinchonidine which increased mental delusions as Quinine had done before. He is still under treatment, occasionally getting a paroxysm of ague with very profuse sweating. He is improving under mineral acids, and his distressing mental delusions have disappeared.

10. In case 5, the remedy produced violent vomiting, and it was discontinued at the patient's request. The same remark may be made as to case 6, subsequently cured by Quinine. Cases 1 and 12 were very mild cases which would probably have been easily cured without any Chinchona preparation. In case 10, nine grains of Chinchonidine appeared to prevent the recurrence of a paroxysm. The patient, a very anæmic female, was subsequently cured by ferruginous remedies.

(Signed) W. N. CHIPPERFIELD, Asst. Surgeon,

Acting Physician, General Hospital.

MADRAS,
18th September 1866.

From the Inspector General, Medical Department, to the Secretary to Government, Revenue Department, dated Fort Saint George, 8th March 1867, No. 84.

1. In continuation of this Office letter No. 372, of 11th October 1866, I have the honour to forward, for submission to the Home Government, a copy of each of the tabulated reports received printed since that date, of the therapeutic effects of the Chinchona alkaloids received from England for experimental trial.

2. The Report and tabulated statistics, received up to the end of February by the Chinchona Commission, have already been submitted to Government.

LIST.

	Chinchonine.	Chinchonidine.	Quinidine.	Chinchona leaves and bark.	Report.
Dr. Chipperfield, General Hospital, Madras.	1	1	1	...	1
Dr. Cleveland, Mysore. ...	1	1	1	...	...
Dr. Dougall, Northern Circars...	2	2	2	...	...
Dr. Fitzgerald, Labuan ...	2	2	1	...	...
Dr. Foy, Sumbulpore ...	3	3	3	...	...
Dr. Heard, Shemogah ...	2	2	2	...	...
Dr. Henderson, Bangalore ..	...	1	1	...	...
Dr. Houston, Doomiguidiem ...	3	2	2	1	...
Dr. Keess, Goodaloor(Wynaad)	3	3	3	1	1
Dr. Oswald, Mysore ...	...	...	2	1	...
Mr. Wade, Goodaloor(Wynaad)	...	1	2	...	...
Dr. Walter, Secunderabad ...	3	3	2	3	...
Dr. White, Kamptee ...	1	...	1	...	...
Dr. Whitton, Cochin ...	2	1	2	1	1
Dr. Miller, Thyetmyoo ...	...	...	1	...	...

ORDER THEREON, 19th March 1867, No. 652.

Miscellaneous.

1. Ordered that these papers be transmitted to the Secretary of State.

2. This preliminary report of the Members of the Chinchona Commission on the results of the experimental use of the Chinchona alkaloids is very satisfactory and encouraging.

(True Extract).

(Signed) W. HUDLESTON,

Secretary to Government.

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No. 13.—Mr. Broughton's *First Report on Chinchona grown on the Neilgherry Hills.*

Proceedings of the Madras Government, Revenue Department, 12th April 1867.

Read the following letter from J. Broughton, Esq., Quinologist to Government; to the Secretary to Government, Revenue Department, Fort Saint George, dated Ootacamund, 2nd April 1867 :—

1. I have the honour to enclose a preliminary report on the Chinchonæ of the Government Plantations.

2. I would request permission to proceed on duty to Madras on the arrival of the Government vessel containing my laboratory stores, in order to superintend personally the transit of the same to this place. Any damage to the apparatus would seriously impede my future work.

From J. Broughton, Esq., Quinologist to Government; to the Secretary to Government, Revenue Department, Fort Saint George, dated Ootacamund, 1st April 1867.

1. I have the honour, in the subsequent pages, of submitting such part of the results of my examination of the various products of the Government Chinchona plantations, that possess sufficient interest and definitiveness to be brought under the notice of Government.

Present want of chemical appliances.

2. This examination has been conducted under considerable difficulties, arising from the want of many of the chemical appliances which are requisite for the analysis of Chinchona barks. Notwithstanding the kind assistance I have received from Mr. McIvor and Mr. Batcock on all occasions when the establishment at the Botanic Gardens could supply my wants, much time has been consumed in improvising substitutes for lacking implements, and in making such arrangements as are incident to a new establishment.

C. Succirubra.

3. The greater part of my attention has been devoted to an examination of C. Succirubra. Of all the species yet naturalized in

India, this exhibits the most vigorous growth. It is numerically the most important, since nearly 800,000 plants are now growing in the several plantations. It is, moreover, the bark of this kind that will first find its way into actual consumption. For these reasons the products of the Red Bark trees and the conditions of their occurrence merit an early and careful study.

Marked differences in habit of individual trees.

4. A slight inspection of the more advanced portions of the plantations at Neddivuttum reveals considerable differences in the habit and appearances of the individual Red Bark trees. This has already been remarked by Mr. C. R. Markham, who suggested that these variations in the colouring and habit of the trees might probably be connected with differences in their yield of alkaloids. The accuracy of this conjecture is rendered evident by the results of the analyses of the trunk bark of four trees, which are calculated in per-centages of dry bark, as given below:—

Statement of Analyses.

	I.	II.	III.	IV.
Total alkaloids (hydrated)...	4·85	7·00	6·40	6·4
Alkaloid soluble in Ether (Quinine)...	3·25	4·25	4·75	1·7
Chinchonidine and Chinchonine......	1·60	2·75	1·65	4·7
Sulphate of Quinine obtained crystallized	3·00	4·00	4·55	1·7

In the above analyses, as well as those given subsequently, the Sulphate of Quinine has been obtained in as pure a state as possible.

Remarks on analyses of of Red Barks.

5. Of No. I. it may be remarked that though the poorest specimen that has come under my notice, it gives at least an equal yield to the best Ecuador Red Barks. Nos. II., III., and IV. are considerably richer. Seven per cent. of alkaloids in the natural (unmossed) bark appeared to me so large an amount that I was led to repeat the ana-

lyses by a different method, which, however, closely corroborated the former results. No. II. owes its richness in alkaloids to the presence of an unusually large amount of Chinchonine, which crystallized from an alcoholic solution with the greatest readiness. No. IV. contained comparatively but a small amount of Quinine, but in its stead a large amount of Chinchonidine, which easily yielded a sulphate not distinguishable by the eye from that of Quinine. In this sample of bark the total quantity of crystalline sulphates obtained was no less than 5·2 per cent. of the weight of the dry bark. All the barks contain a certain amount of quinine apparently not susceptible of crystallization.

Bark of branches.

6. These analyses were made in all cases with the bark of the trunk, which (doubtless on account of superior age) is much richer than that of the branches yielding "quill bark." Some of the latter, which I examined, yielded but three per cent. of alkaloids, from which 1·4 per cent. of crystalline sulphates was obtained.

Yield of alkaloids in bark still probably increasing.

I am of opinion that the foregoing data, compared with those of Mr. Howard's earlier reports, afford grounds for believing that the amount of alkaloids in the barks is still on the increase.

Considerations affecting value of Red Barks.

7. It should be stated that the richness of the Red Barks in alkaloids, though doubtless entitling them to the first place among our Indian barks, is not in many respects a true measure of their intrinsic value for manufacturing purposes. This value depends also on the readiness with which the Quinine, &c. can be obtained in a pure and crystalline form. In this respect the natural unmossed Succirubra bark is at some disadvantage, since its alkaloids are more difficult to obtain in a pure form than those yielded by some other kinds.

Mossed Red Bark.

8. Mr. McIvor's valuable and interesting method of treatment of the barks by mossing has already been fully described by himself. Unfortunately I was unable to obtain a specimen of bark that had been under this treatment for more than six months. A sample of bark of a tree of four years and a

half old renewed under moss, yielded (in per-centages of dry bark) :—

Analyses of mossed renewed Bark.

Total alkaloids (hydrated)	7·10 per cent.
Alkaloid soluble in Ether (Quinine) ...	3·95 " "
Chinchonine and Chinchonidine	3·15 " "
Crystallized Sulphate of Quinine obtained	3·45 " "

9. In this instance the comparative youth of the renewed bark does not permit me to quote so high a per-centage of alkaloids as that found some time since by Mr. Howard in bark that had been longer under treatment.* Nevertheless, the advantages of the mossing process applied to this bark, makes itself at once evident to the worker by the readiness and purity with which the sulphates crystallize. The amount of the latter would be much larger had sulphate of Chinchonidine been included.

Root Bark.

10. An examination of the root bark of C. Succirubra enabled me to corroborate the statement of Dr. De Vrij that it contains a large amount of alkaloids.

The dried bark yielded—

Total alkaloids (hydrated)... ...	6·0 per cent.
Alkaloid soluble in Ether (Quinine)	2·15 "
Chinchonidine and Chinchonine ...	3·85 "
Crystallized sulphate of Quinine obtained	2·00 "

Remarks on analyses.

From the above it appears that the greater part of the alkaloids in this root-bark consists of Chinchonidine and Chinchonine. The former alkaloid occurs in considerable quantity. In no case, however, could the roots be a remunerative source of alkaloids, since their bark is thin, contains 74 per cent. of water, and is laborious to procure.

Leaves of C. Succirubra.

11. The occurrence of alkaloids in the leaves of the Chinchonæ has been the subject of numerous and conflicting statements.

* Government Return, 1866, p. 134.

In order to enquire into this interesting and important point, I worked with four lbs. of the leaves of C. Succirubra.* From those I succeeded in obtaining 3·1 grains of alkaloid, of which about 1 grain was soluble in Ether, and gave a faint indication of Quinine when tested with Chlorine water and Ammonia. From none of the alkaloid obtained from the leaves was I able to obtain a definite crystalline sulphate or oxalate.

Probable value of leaves.

Though I would refrain from advancing a decisive opinion until I have examined the leaves at another period of the year, it appears to me to be probable, from the above examination, that the leaves of C. Succirubra (even in the fresh green state) are worthless as a source of febrifuge alkaloids. They appear to owe their bitterness to the presence of Quinovin, a substance which may probably possess some tonic qualities.

C. Officinalis.

12. Next to the C. Succirubra the most important species we at present possess is the C. Officinalis, whose varieties yield the Crown Barks. The three varieties *Bonplandiana, Uritusinga,* and *Crespilla,* greatly resemble one another, and appear to differ even less among themselves than some individuals of C. Succirubra, of which Botanists recognize but one variety.

Var Bonplandiana.

Of these varieties, *var. Bonplandiana* is the most important, since upwards of 750,000 are now growing on the plantations. This variety also comprises the most advanced trees, whose identity with their name could be considered certain. The trunk

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* The method of proceeding adopted was as follows:—The bruised leaves were boiled in a chattie with water acidulated with Sulphuric Acid, and the bitter greenish decoction was separated by drainage and strong pressure through a cloth. It was then concentrated by evaporation, allowed to cool, and made strongly alkaline by the addition of milk of lime. A considerable precipitate was thus obtained, which was separated by filtration and purified by careful washing; then dried at 200 F. and powdered. This powder was then repeatedly boiled with strong spirit, and the alcoholic extracts evaporated to dryness. The residue consisted mainly of a bitter yellow resin. It was boiled with acidulated water (by which but a small proportion dissolved) and filtered. The solution was then made alkaline with Caustic Soda and shaken up in a separator with Chloroform. The Chloroform was then separated, and being evaporated by a gentle heat in a capsule, left the purified alkaloid as residue.

bark of a tree from Dodabetta plantation yielded in the dry bark the following per-centages:—

Analyses of Crown Bark.

Total alkaloids (hydrated)	3·6	per	cent.
Alkaloid soluble in Ether (Quinine)	2·8	,,	,,
Chinchonine and Chinchonidine	0·8	,,	,,
Sulphate of Quinine obtain crystallized	2·8	,,	,,

The fresh bark contained 66 per cent. of water.

A second specimen of somewhat different habit yielded—

Total alkaloids (hydrated)	3·8	per	cent.
Alkaloid soluble in Ether (Quinine)	3·0	,,	,,
Insoluble in Ether (Chinchonine)	0·8	,,	,,
Crystallized Sulphate of Quinine obtained.	2·9	,,	,,

Value of Crown Bark.

Hence it appears that even at their present age the trees of C. Officinalis *var. Bonplandiana* yield a bark of admirable quality, and nearly equal to the fine Calisaya bark of Bolivia. In the last quoted analysis no alkaloids were found, except Quinine and Chinchonine, the latter occurring in but small quantity. I am of opinion that this bark possesses, for manufacturing purposes, certain advantages over the Red Bark, that in some measure tend to compensate for the smaller yield and slower growth of the tree producing it. The Crown Bark yields its alkaloids with greater ease, owing to the small amount of resin and colouring matter with which they are associated.

Mossed Crown Bark.

13. An analysis of similar bark that had been renewed six months under moss yielded—

Total alkaloids (hydrated)	6·8	per	cent.
Alkaloid soluble in Ether (Quinine)	4·8	,,	,,
Chinchonine and Chinchonidine	2·0	,,	,,
Sulphate of Quinine obtained crystallized	4·1	,,	,,

Increased yield produced by mossing.

This analysis shews that the mossing process, though only applied for six months, has greatly increased the yield of alkaloids in this variety of bark.

14. I would here beg permission to state, without advancing any new hypothesis, such known facts that appear

in a great measure to explain the increased amount of alkaloids produced by mossing the bark.

Deleterious action of light on bark.

The injurious action of light on the Chinchona bark and alkaloids was clearly pointed out many years ago by Pasteur,* a Chemist, to whom our present knowledge of these alkaloids is largely indebted. It is on account of this destructive action of light that he recommended shielding the bark from sun-light while drying ; pure, colourless solutions of the alkaloids are soon coloured brown and partially decomposed by exposure to sunshine. The same change takes place when dry or moist sulphate of Quinine is insolated.

Experimental verification.

15. In order to verify these facts in the climate of the Neilgherries, I prepared from Red Bark pure colourless solutions of each alkaloid and sealed them up in vacuo in glass tubes, in order to eliminate possible oxidation. After three days' exposure to the sun's rays they all became coloured, while similar solutions preserved in the shade remained unaltered. The tube containing Quinine was opened after a fortnight's exposure, and its contents examined. It was then found that a considerable quantity of a dark-coloured resinous substance had been formed, and that much of the alkaloid had lost its power of crystallizing. I would submit that these circumstances are very significant, when applied to the elucidation of the cause of some of the changes occurring in the living bark, and are most suggestive of future experiments in the cultivation of the latter.

Moss does not prevent oxidation.

16. It has been stated that the action of the moss is to protect the alkaloids from oxidation. This is contradicted by the circumstance that moss does not exclude either air or oxygen. It is also incompatible with the fact that the Quinidine produced under moss in Micrantha bark is really a more oxidized substance than the Chinchonine produced in the natural bark when fully exposed to the air.

Natural renewed bark.

17. It appeared to me that an examination of bark that had been renewed by natural processes, without the application of

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* Comptes Rendus XXXVI. p. 26, and XXXVII. p. 162. Also Koppo Jahresbericht 1853, p. 419.

moss, would possess considerable interest. It was suggested by a statement in Howard's "Nuera Quinologia of Pavon," and also given on the authority of Ruiz.* I was able to obtain a small quantity of such renewed bark from two Succirubra trees which had been injured and partially stripped of their bark by the falling of a log in October 1864. The renewed bark was thicker than that of the natural bark, measuring 0·19 to 0·22 inches, instead of 0·16 inches, and had replaced itself mainly from the edges of the wound; not from the surface, as is the case in mossed bark, but its analysis gave but five per cent. of alkaloids, of which about 3·25 appeared to consist of Chinchonidine and Chinchonine. Unless, therefore, the effect had been impaired by the lapse of time or the character of the injury, the quality of this renewed bark does not appear to corroborate the statement I have had the honour to cite above.

Rationale of mossing the bark.

18. I would submit that the foregoing facts and considerations render it highly probable that the exposure of the *living* bark to direct sun-light has the effect of diminishing the yield in alkaloids, and hence the advantage of direct protection.

I would beg leave to defer a comparative estimate of the respective values of the three varieties of C. Officinalis till a subsequent report.

C. Lancifolia.

19. Analysis of the bark taken from a plant of C. Lancifolia, two years old, yielded 0·8 per cent. of alkaloids, in which (though but a very small amount of bark was at my disposal) I was able to obtain distinct traces of crystalline sulphate.

C. Micrantha.

20. An analysis of the trunk bark of C. Micrantha of four and a half years old yielded the following numbers, expressing percentages in dry bark :—

Total alkaloids	7·1
Alkaloid soluble in Ether	0·3
Chinchonine	6·8
Crystalline sulphates	None.

* Nuera Quinologia. C. Uritusinga, p. 3.—"They cut off (Don Riopio told me) the whole of the Bark of the trunk of a small tree, leaving only a broad strip so as not to destroy the tree, which gradually replaces its loss; and the second time of cutting the bark is called *cascarillas resecatas*, and esteemed of superior quality."

This large amount of Chinchonine crystallized from solution in alcohol with the greatest readiness and purity, forming splendid crystals 0·18 inches long. Huanuco bark contains usually only about 2·0 per cent. of alkaloid. Should Chinchonine come into use as a febrifuge (as appears not improbable from the experimental results of the Chinchonine Commission,*) this Micrantha bark will furnish a most easy and abundant source. The tree rivals C. Succirubra in rapidity of growth, and the bark at present is 0·17 inches thick. It loses on drying 73 per cent. of water.

Value of Micrantha bark.

21. Nearly all the above analsyes were made with the fresh undried bark of the trees. Some preliminary experiments shewed me that the bark in the "green" condition presented several advantages which facilitate its examination for alkaloids. The latter are extracted with far greater ease from the fresh than from the dried and powdered bark; and with much less expenditure of acid and labour, and consequently with diminished risk of error or alteration in composition. I am of opinion that this property of the fresh bark will eventually become of considerable importance. For purposes of quotation, it is of course indifferent whether the analyses are conducted with the fresh or the dried bark, provided the process of drying be conducted with proper care.

Advantages of working with fresh barks.

22. I have communicated these and other results of my observations to Mr. McIvor, and have discussed with him various applications to future cultivation. I have had to thank Mr. McIvor for much kind assistance, and also for some valuable information concerning the plantations and their products.

Results communicated to Mr. McIvor.

23. I trust I may be pardoned for expressing my gratification at finding, from personal examination, that the Government Chinchona plantations offer in their present stage such unmistakeable indications of success.

Present success of Cinchona plantations.

24. I have the honour to forward by banghy four specimens of alkaloids prepared from Red Bark, and illustrative of the foregoing report.

* Proceedings of the Madras Government, No. 302 of 1867.

ORDER THEREON, 12th April 1867, No. 855.

1. The Government have perused with much interest Mr. Broughton's very encouraging Report, which will be forwarded to the Secretary of Sate, and communicated, with the recent Report of the Chinchona Commission, to the Government of India and of the other Presidencies.

2. They note with satisfaction Mr. Broughton's testimony to the value of the mossing process introduced by Mr. McIvor, and request that the results may be recorded in all reports of bark analysis when the tree has been thus treated.

3. Mr. Broughton will proceed to Madras on duty on the arrival of the ship containing his apparatus, for the purpose of taking charge of the cases and superintending their conveyance to Ootacamund.

(True Extract.)

(Signed) W. HUDLESTON,
Secretary to Government.

No. 14.—*Madras Mortuary Report for the First Quarter of* 1867. By W. ARNOLD SMITH, M. D., Officiating Secretary, Sanitary Commission.

THE health of Madras during the first quarter has not been altogether satisfactory.

The total number of deaths registered amounts to 3,715, which, contrasted with the mean for ten years of similar quarters from 1857 to 1866 inclusive, gives an increase of 730 deaths to the period under review.

Taking the first quarters of six previous years, as shewn in the margin, we observe that there is still a heavy increase in the mortality of the present year of 518 deaths. The years 1862 and 1863 are the only two years in the above period which show a larger number of deaths.

1861...	2,809
1862...	3,912
1863...	3,783
1864...	3,125
1865...	2,594
1866...	2,960
Total...	19,183
Mean...	3197·1

Contrasting the quarter under review with that which has past, and which was also a sickly one, it is satisfactory to find a decrease in the number of deaths amounting to 112.

The death-rate for the past quarter has been at the annual rate of 33·02 per mille, which must be considered high.

There have been 39 deaths amongst Europeans, of which 11 have been females. This number is 1·6 less than that of the average for the first quarters of ten previous years. Nearly half these deaths has been from miasmatic disease, of which Fever contributes 2, Dysentery 5, Diarrhœa 3, and Cholera 6.

The deaths among East Indians amount to 98, of which the larger proportion is females (54). The deaths amongst this class of the population have increased on the ten-year period by 21·8 deaths. More than half these deaths is from miasmatic diseases, amongst which cholera contributes 23.

Hindoos, from composing the great bulk of the population, make up the greater number of deaths. This amounts to 2,912, the male being 248 in excess of female mortality. The increase of deaths in this class over the ten years' average, amounts to 510·1 deaths.

Mahomedans also show a great increase in the number of deaths, which amounts to 200·4 beyond the average.

The total number registered from this section of the population during the past quarter amounts to 666, of which number 356 are females, or 46 more than the opposite sex.

Taking the last Municipal census* (which it is necessary to say must be received with caution) as the basis of our calculation, we find that the annual death-rate amongst the above different classes of the population has been as follows :—

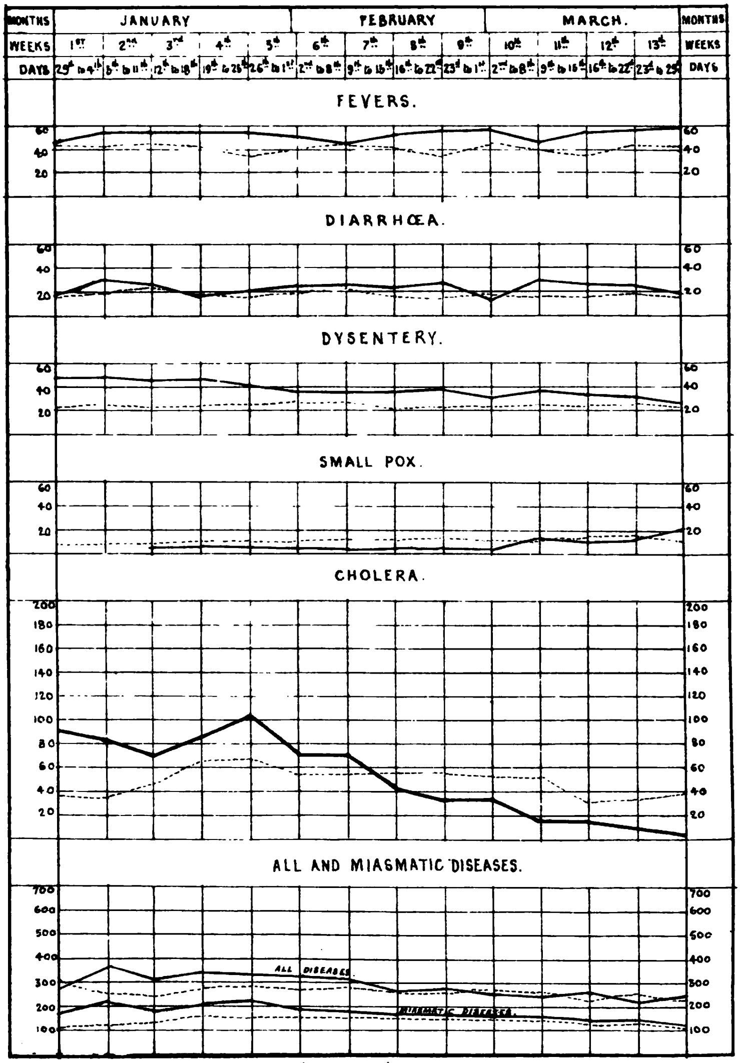
	Per Mille.
European and East Indians..........	28·52
Hindoos..............................	33·2
Mahomedans......	41·6

Putting aside the results given by these figures, there is no room for doubt that the proportion of mortality in the Mahomedan section of the community has been greatly in excess of other classes, which may be accounted for by the unfavourable sanitary conditions of the parts of the town in which the Mahomedans live, and from the abject poverty of the classes who are dependent on the stipendiaries, and upon trades connected with the late Palace.

Looking to the causes of this increased number of deaths over the average for ten previous years, we find that of the

* The population taken by the Municipal Commissioners is said to be 427,771, but as this must be below the real number, 450,000 has generally been taken as a nearer estimate in calculating the death-rate in these Returns. In this instance we adhere to the Municipal census.

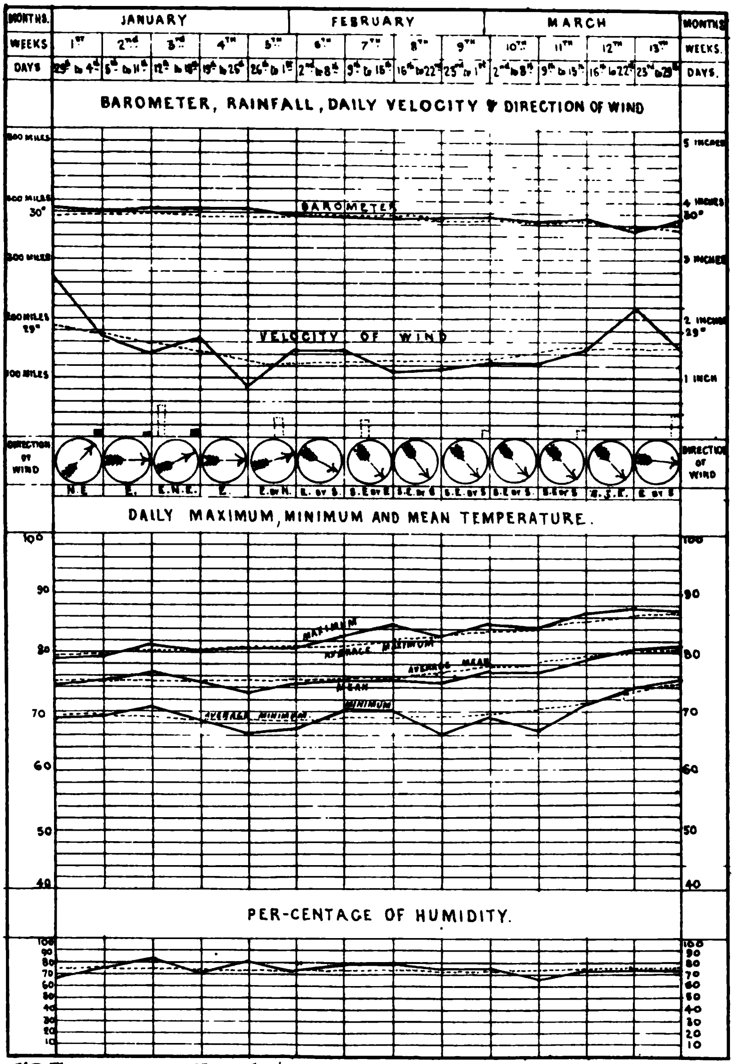
DIAGRAM SHOWING THE MORTALITY FROM MIASMATIC DISEASE IN MADRAS, DURING THE 1ST QUARTER. 1867.



N.B. The total Mortality from each disease during each week is plotted on the perpendicular lines which represent these periods. The horizontal dotted wave lines show the average mortality from each disease for the previous five years.

Alex.r Barren: Lithog. Madras

DIAGRAM SHOWING THE METEOROLOGICAL CONDITION OF MADRAS, DURING THE 1ST QUARTER 1867.



N.B. The mean weekly Meteorological elements are plotted on the perpendicular lines. The dotted wave lines show the bimonthly average for twenty years from observations kept at the Madras Observatory.

Alex. Barren Lithog. Madras

3,715 total deaths registered, 2,183, or nearly three-fifths are from miasmatic diseases.

The latter order of disease shews an increase of 508·6, and other diseases 222·1 deaths on the ten year average.

Miasmatic Diseases.

1861...	1,387
1862...	2,747
1863...	2,449
1864...	1,701
1865...	1,244
1866...	1,521
Total...	11,049
Average...	1641·5

Taking the mean of miasmatic diseases for the first quarters of six previous years, as shewn in the margin, we observe that there has been an increase of 541 deaths in this order of diseases. A more minute examination of the principal diseases which have made up this order shows us this increase has been chiefly due to fevers and dysentery.

A glance at the Mortality Chart at once brings these facts to the mind as well as other points connected with those diseases which are the chief contributors to the mortality of our crowded native cities.

The number of deaths registered under the head of fevers has amounted to 697, which is 172·2 in excess of the mean for six previous years.

Fevers.

1861...	508
1862...	521
1863...	524
1864...	611
1865...	444
1866...	541
Total...	3,149
Mean...	524·8

The greatest number of deaths registered in any one week has been 59, namely, for that ending February 22nd; and the least number (45) in the week ending March 8th.

A glance at the chart shows how steadily the wave line of death keeps above the average for the whole quarter, only approaching it once in the sixth and tenth weeks. The deaths are in excess of those registered last quarter by 35.

The deaths registered from diarrhœa amount to 277, or 45·2 above the average. The greatest number of deaths (29) registered in any week from this cause was that ending February 8th, and the minimum number (15) on the 1st March.

Diarrhœa.

1861...	165
1862...	232
1863...	265
1864..	216
1865..	246
1866..	267
Total...	1,391
Average...	231·8

It will be observed that the wave line of deaths from this cause only falls below the average on too occasions, namely, in the third and ninth weeks. These deaths show a decrease on last.

The total deaths registered from dysentery amount to 484 or 169·5 deaths above the average. A probable cause for the increased mortality from this and the former disease is to be found in the fact that a large quantity of new rice was introduced into the market during the past quarter, and being cheaper, was doubtless purchased and partaken freely of by the poorer classes of the population.

Dysentery.	
1861...	318
1862...	272
1863...	338
1864...	350
1865...	272
1866...	337
Total...	1,887
Mean...	314·5

This kind of rice, it is well known, is very indigestible, and if eaten largely of, is certain to produce derangement of the bowels. Such an article coming into the market immediately after a season of great scarcity, was doubly dangerous to those who were reduced in health and strength by previous privation.

The greatest number of deaths (47) occurred in the week ending January 4th; the minimum (24) in that ending March 29th.

It will be observed how strikingly the wave line of deaths from dysentery continues to run high above the average, it being only towards the end of the quarter that it commences to fall.

The deaths from this disease are 75 more than last quarter.

There are meteorological causes which may have tended towards the increased mortality from this disease, which are noticed at the end of this report.

The number of deaths registered from small-pox amount to 98, or 56 less than the average. Although this is to a certain extent satisfactory, it is not altogether so great a decrease as we might expect from the increased extension of the prophylactic operation of vaccination. Amongst the first quarters of six previous years, we observe that there are three years, namely, 1863, 1865 and 1866, where the deaths were very few, compared with the past period, and an examination of the chart shows a sudden rise in the last

Small-pox.	
1861	204
1862	545
1863	33
1864	108
1865	6
1866	28
Total ..	924
Average...	154

week of the quarter in the deaths from this disease above the average wave line, which leads us to fear that the month in which we are writing will show an increase of deaths on the average of no small amount. It must, however, be remembered that April is the month of the year in which small-pox attains its maximum with unerring certainty.

A sudden rise in the mortality from this disease occurred in the tenth week ending March 8th, when the deaths rose from 3 to 14, and attained a maximum of 21, in the 13th week ending March 29th.

No death occurred during the first week.

The deaths from this disease are in excess of those of last quarter by 86.

An examination of the Tables shows that the deaths from this disease occurred amongst the different classes of the community, as follows:—

		Ratio per *Mille* of Population.
Europeans... ...	...	·31
East Indians. ...	5	
Hindoos... ...	82	·23
Mahomedans. ...	11	·17

The total admissions from Cholera have been 600, showing the very slight increase of 16 deaths on the average mortality from this disease, for six similar quarters, as shewn in the margin. Taking, however, four out of the six years, we observe that the mortality is considerably in excess of what it usually is during the first quarter.

Cholera.

1861...	164
1862..	1,139
1863...	1,279
1864..	349
1865...	247
1866...	321
Total...	3,499
Average...	583·1

The excessive mortality was chiefly confined to the first six weeks of the quarter, in which period 477 out of the 600 deaths occurred; during the remaining period the deaths only amounted to 123. These facts are clearly brought to notice by the chart.

In the 4th week ending January 25th, the deaths amounted to the maximum of 104. They fall to a minimum (2) in the last week of the period under review.

There is a decrease of 88 deaths from cholera on that of last quarter.

From Appendix C, it will be observed that the deaths have been registered throughout the quarter, as follows:—

January..	364
February..	178
March..	58

The greatest mortality (118) has occurred in Division IV; 59 of the death being at Saint Thomé, and 31 at Royapettah.

The Mahomedan quarter, Triplicane, has also 55 deaths recorded against it.

It is worthy of record that Chintadrepetta has suffered but slightly from this epidemic outbreak.

In order to obtain an insight into the meteorological condition of Madras for the quarter, an inspection should be made of the diagram attached.

Atmospheric Pressure.

This element has been slightly greater during the quarter than shewn by the average of 20 years, namely, 29·975 against 29·956. No very remarkable variations have taken place, except a fall in the Barometer, which usually takes place about the 5th week on the change of the wind from north-east to a south-easterly quarter. A reference to the 1st Quarterly Chart for 1866 shows a similar, although a more marked change at this period.

The barometer stands above the average during the greater part of the first and latter half of the quarter.

Temperature.

The wave line of maximum temperature has been above the average the whole quarter, while that of the maximum crosses and re-crosses the latter five different times.

These two elements have been 83·7 and 69·9 against a mean of 83·2 and 70·2 respectively.

The mean temperature has been 76·5 against the 20 years' mean of 76·9 showing, on the whole, a slight decrease in the heat of the atmosphere.

An examination of the chart shows those points of the quarter where there was a rise or fall in the thermometer.

These changes occur in the 2nd, 4th, 6th, 8th, and 11th weeks, after which there is a sudden rise in the temperature, to the end of the quarter. Those are points with which it

is interesting to compare the increment and decrement of the mortality.

With the exception of the 10th and 11th weeks, the wave line of humidity is above the average during the whole quarter. At the above periods, the line makes a sudden dip corresponding to a fall in the temperature.

Humidity.

The average percentage of humidity has been 76·4, being 9° above the average. Some variations in the wave line of humidity occur at the commencement of the quarter in the 2nd and 4th weeks, when it attains a maximum of 82 and 83 per cent. respectively.

The wind has blown, as usual, at the time of the year under review, from a north-east quarter during the first five weeks, when it changed to a south-easterly one for the remainder of the quarter.

Prevailing Wind.

These turning points in the prevailing winds are interesting, when examined in connection with the chart of mortality.

The mean velocity of the wind has been 142·7 miles daily, being an increase of 3 miles on the average for past years.

Sudden variations are noticed in the course of the wave line of this element in the 1st, 4th, and 12th weeks. In the first of these periods, the velocity falls from 250 to 171 miles, and in the 4th week from 167 to 99; in the last period mentioned, it rises from 151 to 206, and as suddenly falls to 149 miles.

The only rain which has fallen during the first quarter was registered during the first three weeks, amounting to ·17 inches. The twenty years' average rain-fall for this quarter is 1·7.

Rain fall.

It has been before noticed there is a general tendency of the wave line showing the deaths registered under the head of fever, to follow the wave line of temperature, showing therefore that an increase of temperature seems to affect unfavourably the mortality from this class of diseases.

The wave line of Diarrhœa shows an opposite course to that of Fever, and attains its maximum and minimum points at different periods. A marked fall in this disease

occurs in the 9th week, which is characterized by a rise in the temperature.

Both deaths from Dysentery and Diarrhœa rise in the tenth week ending March the 15th in a very marked manner, corresponding to a fall in the temperature, with a decrease in the percentage of humidity.

The changes in the velocity of the wind is a meteorological element of great interest in the comparison of climate and disease, as upon its action depends the thorough ventilation of over-populated towns and crowded dwelling houses.

It has been noticed by more than one observer that the deaths from diseases increase numerically during those parts of the year which are characterized by close sultry nights and periods when the air may be said to stagnate over localities thickly populated.

In examining the wave line of cholera and contrasting it with meteorological elements, we might naturally expect to find the deaths increasing with decreased ventilation, that is to say, with a stagnating atmosphere; but any such theory must be at once rejected when practical illustration of the real state of things is placed before us.

Going back to the diagrams which have accompanied these Reports, during the year 1865, it is observed that there is no connection whatever between the wave line of deaths from this, and the daily motion of the atmosphere, as an examination of these elements shews, that from the 1st of January 1865 to the 31st March 1866, the two wave lines have taken the same direction in 32, and a different one in 29 instances, which seem to lead to the conclusion at present this element has nothing whatever to do with the prevalence of this mysterious disease in Madras.

It is worthy of record in connection with this and other meteorological elements to record the very wide-spread epidemic of influenza which took place amongst horses at the Presidency, but which reached its height about the 12th week of the quarter ending March 22nd, corresponding to an increase observable in Fever and Dysentery, in the population of Madras.

In a communication from the Government Astronomer on the subject, we are informed that during March the *solar* heat* was far above the average, while the shade tempera-

* "Owing to scarcity of solar spots?"

ture was about the usual average; but the grass minimum (that is a thermometor placed on the ground outside) was extraordinarily low. Long shore winds blew throughout this period, and a stagnation of the air generally took place from midnight to sunrise, being succeeded by a sudden rise in the wind about 8 A.M., just two hours after the most chilly part of the night *ground* cold.

The following tabular statement, which has been kindly furnished by Mr. Pogson, shews the excesses and defects of the mean half-monthly sun and grass thermometers, and the state of the wind.

1867.	Radiation Thermometer.		Anenometer.	
	Sun above average.	Ground below average.	Midnight to 8 A.M.	8 A.M. to 6 P.M.
March 1st to 15th..	6°·8	5·1	2 miles from S.S.E.	9½ from S.E.
March 16th to 21st.	8°·1	0·2	3 miles from S.E.	11 from S.E.

These effects, as Mr. Pogson states, are all marked enough about the period of the above epidemic (March 22nd), and effects of these meteorological elements upon horses might be as follows.

The animals exposed to and worked in sunshine would get over-heated during the day. The stagnation of the air at night from midnight to sunrise would keep up their over-heated state, and the sudden rise of the wind about 8 A.M. would be quite sufficient to the wide-spread epidemic, and would be more severely felt in those stables which are freely exposed to the wind.

These facts must be taken into consideration with the increased mortality which has been observed in Fever and Dysentery, when we remember the exposure suffered by the poorer classes to the sun's heat during the day, and their position on the cold ground at night.

APPENDIX A.

Deaths in Madras for First Quarter, 1867.

	Europeans.		East Indians.		Hindoos.		Mahomedans.		Total.		General Total.
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
Small-pox	...	...	3	2	38	44	5	6	46	52	98
Fevers	1	1	7	7	311	301	29	40	348	349	697
Dysentery	4	1	1	4	205	189	34	46	244	240	484
Diarrhœa	2	1	3	2	114	103	20	32	139	138	277
Cholera	4	2	11	12	215	207	62	87	292	308	600
Other Miasmatic diseases ...	...	...	...	1	9	5	9	3	18	9	27
Total Miasmatic diseases ...	11	5	25	28	892	849	159	214	1,087	1,096	2,183
Total of all other diseases ...	17	6	19	26	688	483	151	142	875	657	1,532
Total...	28	11	44	54	1,580	1,332	310	356	1,962	1,753	3,715
	39		98		2,912		666		3,715		
Mean Mortality of ten first quarters from 1857 to 1866.											
Miasmatic diseases ...	13·2	4·2	17·4	17·8	716·8	646·9	122·0	136·1	869·4	805·0	1674·4
Other diseases ...	17·4	5·8	18·7	22·3	555·1	483·1	105·7	101·8	696·9	613·0	1309·9
Total...	30·6	10·0	36·1	40·1	1271·9	1130·0	227·7	237·9	1566·3	1418·0	2984·9
	40·6		76·2		2401·9		465·6		2984·3		
Increase	...		21·8		510·1		200·4		...		730·7
Decrease	1·6		...		...		...		...		...

APPENDIX B.

Table shewing the mortality from Miasmatic Diseases in the last 13 weeks.

	Jan. 4	Jan. 11	Jan. 18	Jan. 25	Feb. 1	Feb. 8	Feb. 15	Feb. 22	Mar. 1	Mar. 8	Mar. 15	Mar. 22	Mar. 29	Total.
Fevers...................	53	55	56	57	50	47	55	59	58	45	54	55	58	702
Diarrhœa....................	28	23	17	20	21	29	23	25	15	26	22	23	19	291
Dysentery..................	47	44	45	41	39	37	37	40	32	40	36	34	24	496
Small-pox.................	0	3	6	4	3	2	4	4	3	14	11	13	21	88
Cholera	81	70	82	104	70	70	45	35	35	18	18	9	2	639
Other Miasmatic Diseases.	2	0	1	0	3	1	1	4	5	2	0	3	3	25
Total...	211	195	207	226	186	186	165	167	148	145	141	137	127	2,241

Average of the corresponding weeks for 5 previous years.

Fevers.....................	40·2	43·4	42 6	38·4	41·0	44·8	41·4	37·6	42·4	40·0	38·4	41·6	41·8	533·6
Diarrhœa....................	20 0	21·0	20·0	19·2	21·4	23·4	18·2	16·8	19·2	17·8	16·6	19·8	17·2	250·6
Dysentery..................	25·8	23·2	24·4	25·4	27·4	25·6	20·2	23 4	24.2	25·4	22·6	24·4	21·4	313·4
Small-pox..................	5·2	6·0	8·2	6·2	6·8	12·8	14·0	14·0	11·6	13·0	17·6	18·6	13·2	147·2
Cholera	30·0	43·2	66·6	67·4	58·2	58·0	59·8	59·6	54·6	53·2	32·8	34·6	39·6	665·6
Other Miasmatic Diseases.	2·8	2·6	1·6	2.2	1·8	3·2	3·4	3·6	4·2	4·4	3·0	3·0	4·2	40·0
Total...	132·0	139·4	163·4	158·8	156·6	167·8	157·0	155·0	156·2	153·8	131·0	142·0	137·4	1950·4

Mean Meteorological Observations, for the past 13 weeks.

Barometer reduced 32° F.	30·004	30·016	30·024	30·031	29·999	29·951	29·939	29·969	29·993	29·939	29·982	29·899	29·980	29·975
Mean Maximum Temperature	79·5	81·8	80·3	80·8	80·6	82·7	84·8	83·6	84·9	84·3	86·4	88·0	87·5	83·7
Do. Minimum do.	69·6	71·0	69·3	66·7	67·9	70·5	70·4	66·9	68·7	67·5	71·0	74·0	75·4	69·9
Do. Temperature	74·5	76·0	74·4	73·0	74·5	76·8	76·8	74·8	76·4	76·8	78·7	80·6	81·4	76·5
Do. Humidity.	76	83	76	82	74	80	80	77·	78	68	74	75	71	76·4
Prevailing Wind	N. E.	E.	E.N.E.	E.	E.byN.	S. E. by E.	S. E. by S.	S. E. by S.	S. E. by S.	S. E. by S.	S. E. by S.	S.S.E.	E.byS	S. E. by S.
Mean velocity in Miles	171	141	167	99	145	146	114	116	124	123	151	206	149	142·7
Rain-fall	0·05	0·03	0·09	...	...	...	...	...	...	...	...	...	...	0·17

Table shewing the Mean Half-Monthly Meteorological condition of Madras for 20 years past.

	Half month ending 15th January.	Half month ending 31st January.	Half month ending 14th February.	Half month ending 28th February.	Half month ending 15th March.	Half month ending 31st March.	Average.
Barometer reduced to 32° F	30·004	29·991	29·982	29·958	29·920	29·886	29·956
Mean Maximum Temperature	80·0	80·6	81·8	83·8	85·5	87·5	83·2
Do. Minimum do.	69·1	68 2	69·0	69·7	71·7	74·2	70·3
Do. Temperature	74·6	74·5	75·6	76·9	78·9	80·9	76·9
Do. Humidity.	76	75	75	75	75	76	75·3
Prevailing Wind.	N. E.	N. E. by E.	E	E. S. E.	S. E.	S. S. E.	N. E.
Mean velocity in Miles	158	126	134	129	137	150	139·0
Rain-fall	0·64	0.37	0·27	0·05	0·05	0·32	1·7

APPENDIX C.

Deaths from Cholera in each District.

		January.	February	March.	TOTAL.
I. Divn.	Fort Saint George...........	...	1	...	1
	Black Town or Mootealpettah.	19	26	6	51
		19	27	6	52
II. Divn.	Pedoo Naick's Pettah.........	20	17	9	46
	Uttapolliam..................	1	1	1	3
	Big Parcherry................	4	3	2	9
	John Pereira's Gardens........	1	1	...	2
		26	22	12	60
III. Divn.	Triplicane...................	55	25	6	86
	Poodoopaukum................	11	1	...	12
	Fisherman's Pettah...........	...	...	...	...
		66	26	6	98
IV. Division.	Saint Thomé..................	59	14	3	76
	Alwarpettah..................	...	1	...	1
	Royapettah...................	31	12	...	43
	Meer Saib's Pettah............	19	3	...	22
	Kistnampettah................	7	1	...	8
	Tanampettah..................	2	1	...	3
		118	32	3	153
V. Division.	Chintadrepettah..............	7	6	6	19
	Narasingapooram..............	7	1	...	8
	Comaleeswapuram..............	1	1	...	2
	Poodoopettah.................	3	...	...	3
	Egmore.......................	1	...	...	1
	Chetput......................	5	...	...	5
	Codumpaukum..................	...	...	...	...
	Nungumbaukum.................	22	1	1	24
	Mackay's Gardens.............	8	4	...	12
	Nagatha Covil................	3	...	1	4
		57	13	8	78
VI. Division.	Pereamettoo..................	2	1	...	3
	New Town.....................	2	1	...	3
	Vepery.......................	4	1	1	6
	Choolay......................	9	...	2	11
	Gunpowder Mills..............	...	...	...	...
	Pursewaukum..................	6	5	3	14
	Kilpaukum....................	...	...	...	...
	Perambore....................	6	3	1	10
	Viasarapaudy.................	..	...	...	...
		29	11	7	47
VII. Division.	Tondiarpettah................	1	2	2	5
	Washerman's Pettah...........	21	30	11	62
	Monegar Choultry.............	5	3	1	9
	Royapooram...................	16	11	...	27
	Cashemode....................	6	1	2	9
		49	47	16	112
	General Total...	364	178	58	600

METEOROLOGICAL RESULTS *from the Madras Observatory Register, for the month of January* 1867.

January 1867.	Barometer reduced to 32°.	Standard Thermometers. Observed extremes. Maxim.	Standard Thermometers. Observed extremes. Minim.	Standard Thermometers. Daily means. Dry.	Standard Thermometers. Daily means. Wet.	Percentage of Humidity.	Wind. Prevailing direction.	Wind. Daily velocity.	Depth of Rain.	GENERAL REMARKS.
	Inches	°	°	°	°	Per cent.		Mls.	In.	
1	30·004	79·3	69·7	74·9	68·4	72	N.EbyE.	150	....	Fine. [5¼ P.M.
2	30·030	78·3	67·1	74·2	69·2	78	N.EbyN.	178	0·05	Passing clouds. Shower at
3	30·068	79·2	73·7	75·6	66·3	62	N.EbyE.	261	......	Chiefly cloudy.
4	30·055	79·5	68·8	79·5	68·7	79	N. E.	129	....	Chiefly fine. [4¾ A.M.
5	30·041	79·7	69·9	75·1	70·1	79	N. E.	187	0·03	Passing clouds. Shower at
6	30·005	81·1	69·8	75·4	71·6	84	N.E.byE.	143	....	Fine, with passing clouds.
7	29·990	82·5	70·7	75·6	72·8	88	E	95	....	Do.
8	29·977	83·7	70·8	76·0	73·3	88	S.E by S.	96	....	Light clouds.
9	29·993	83·0	71·7	76·5	72·5	83	S. E.	105	....	Fine, with passing clouds.
10	30·051	80·4	70·4	77·6	71·1	79	E.	149	....	Passing clouds.
11	30·052	82·1	73·5	77·1	71·7	77	E. N. E.	210	....	Do.
12	30·010	80·7	73·0	76·9	71·2	76	E. N. E.	286	00·2	Do. [fine.
13	29·992	80·2	72·9	75·8	69·3	73	E. N. E.	235	00·7	Shower at 2¼ A.M. Chiefly
14	30·006	79·1	68·9	74·7	67·5	69	N.EbyN.	176	.....	Fine, with passing clouds.
15	30·040	80·1	67·0	73·6	67·6	74	N.EbyE.	156	....	Passing clouds.
16	30·030	80·7	67·0	73·2	68·3	78	N.EbyE.	118	....	Chiefly fine.
17	30·036	80·7	68·2	73·4	68·8	80	E. N. E.	105	....	Fine, with passing clouds.
18	30·051	80·3	67·8	73·1	69·2	82	E. by N.	90	....	Light passing clouds.
19	30·081	81·1	68·7	74·3	70·4	83	E. N. E.	104	.....	Fine, with passing clouds.
20	30·076	81·2	69·2	74·5	69·0	76	N.EbyE.	135	......	Passing clouds.
21	30·038	79·9	68·1	72·5	67·7	79	N. E.	122	....	Fine.
22	30·032	81·0	66·2	72·9	68·6	88	E. by N.	70	....	Do.
23	30·011	80·4	65·5	72·4	68·7	83	E. S. E.	74	....	Do.
24	29·999	81·2	63·7	71·7	68·5	85	E. S. E.	98	....	Do.
25	29·980	81·0	65·4	72·7	69·1	84	S. E.	89	....	Do.
26	29·989	81·3	66·5	73·4	68·8	88	S.EbyE.	92	....	Chiefly fine.
27	30·000	81·2	68·5	75·7	69·0	72	E.	148	....	Passing clouds.
28	29·986	80·5	67·9	75·4	69·0	73	N.E.byE.	195	....	Fine, with passing clouds.
29	29·997	81·2	67·8	75·4	69·5	75	E. by N.	135	....	Do.
30	30·010	81·1	69·3	75·0	68·4	72	E. by N.	159	....	Passing clouds.
31	30·009	79·8	69·1	73·9	67·0	70	N.EbyE.	169	....	Do.

The Standard Barometer and Thermometers are read at 10 A.M., 4 P.M. and 10 P.M., and the Daily Means are obtained by the application of hourly corrections, deduced from twenty years' observations. The Cistern of the Barometer is 27 feet above the level of the Sea, and the Receiver of the Rain-gauge is three feet from the ground. The Wind and Rain registered are for the current civil day—from midnight to midnight.

N. R. POGSON, *Government Astronomer.*

METEOROLOGICAL RESULTS *from the Madras Observatory Register, for the month of February,* 1867.

February 1867.	Barometer reduced to 32°.	Standard Thermometers. Observed extremes. Maxim.	Standard Thermometers. Observed extremes. Minim.	Standard Thermometers. Daily means. Dry.	Standard Thermometers. Daily means. Wet.	Percentage of Humidity.	Wind. Prevailing direction.	Wind. Daily velocity.	Depth of Rain.	GENERAL REMARKS.
	Inches.	°	°	°	°	Per cent.		Mls.	In.	
1	30·001	79·8	66·0	72·9	67·9	78	N. EbyE	148	....	Fine, with passing clouds.
2	29·972	70·7	65·9	73·0	67·7	77	N. EbyE.	99	....	Fine, with passing clouds.
3	29·987	82·1	68·0	76·3	70·9	77	N. EbyE.	178	......	Passing clouds.
4	29·968	82·6	70·9	77·1	72·0	79	E. by N.	153	......	Cloudy.
5	29·952	83·2	70·4	77·6	73·5	83	E. by S.	190	....	Chiefly fine.
6	29·932	83·4	72·7	77·9	73·6	82	E. by S.	152	....	Passing clouds.
7	29·918	84·1	72·9	78·2	73·8	81	E. by S.	114	......	Fine, with passing clouds.
8	29·930	83·1	72·6	77·6	73·3	82	E.	137	....	Passing clouds.
9	29·957	83·6	72·9	78·2	72·7	77	E. by N.	135	....	Passing clouds.
10	29·971	83·7	71·6	77·4	73·4	83	E.	88	....	Passing clouds.
11	29·926	83·9	70·5	76·6	72·9	84	E. S. E.	96	....	Passing clouds.
12	29·900	84·9	70·3	76·5	72·8	84	S. E.	99	.....	Chiefly fine.
13	29·880	86·0	69·3	76·1	71·4	80	S. S. E.	122	....	Light clouds.
14	29·953	88·1	69·5	76·2	69·1	71	S. by E.	110	......	Light clouds.
15	29·983	83·3	68·9	76·7	71·4	78	E. S. S.	145	....	Chiefly fine.
16	29·965	83·3	68·9	75·0	70·1	79	NE. byE.	92	....	Fine.
17	29·964	83·7	67·3	75·1	70·4	80	E. S. E.	88	....	Fine.
18	29·967	84·6	66·9	74·9	70·0	79	S. by. E.	131	....	Fine.
19	29·962	83·9	67·3	75·0	69·7	77	S.	132	....	Fine.
20	29·976	83·8	66·5	74·4	68·3	74	S.	125	....	Fine.
21	29·968	83·5	66·6	74·2	68·2	74	S. by E.	107	....	Fine.
22	29·970	82·3	64·8	74·9	69·4	76	S. by E.	139	....	Fine.
23	29·957	84.4	64·9	75·2	71·9	86	S. by E.	150	....	Fine.
24	29·972	85·5	71·4	78·2	73·4	80	S. S. E.	175	.....	Light clouds.
25	30·019	84·4	71·6	78·5	73·1	78	S.E.byE	147	......	Fine.
26	30·033	83·4	70·4	76·4	71·8	81	E. by S.	109	....	Fine.
27	30·021	84·5	69·2	77·6	72·9	83	S. E.	108	....	Fine.
28	29·997	85·5	69·0	75·4	69·9	77	S. S. E.	73	....	Fine.

The Standard Barometer and Thermometers are read at 10 A.M., 4 P.M. and 10 P.M., and the Daily Means are obtained by the application of hourly corrections, deduced from twenty years' observations. The Cistern of the Barometer is 27 feet above the level of the Sea, and the Receiver of the Rain-gauge is three feet from the ground. The Wind and Rain registered are for the current civil day—from midnight to midnight.

N. R. POGSON, *Government Astronomer.*

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Meteorological Results *from the Madras Observatory Register, for the month of March,* 1867.

March 1867.	Barometer reduced to 32°.	Standard Thermometers. Observed extremes. Maxim.	Minim.	Daily means. Dry.	Wet.	Percentage of Humidity.	Wind. Prevailing direction.	Daily velocity.	Depth of Rain.	General Remarks.
	Inches.	°	°	°	°	Per cent.		Mls.	In.	
1	29·952	86·4	64·9	75·2	63·9	58	S.	106	.....	Fine.
2	29·929	83·7	64·2	74·8	67·9	71	S. by E.	110	....	Fine.
3	29·961	83·5	66·1	76·6	68·5	67	S.E.by E.	106	....	Fine.
4	29·981	84·5	68·7	77·7	68·1	62	S.E.byE.	111	.....	Light clouds.
5	29·951	83·8	68·8	76·4	68·2	66	E. S. E.	103	....	Fine.
6	29·918	83·8	67·0	76·7	70·0	72	S. E.	132	.....	Fine.
7	29·894	85·2	67·5	77·6	70·0	69	S. by E.	155	.. ....	Fine.
8	29 936	86·2	70·4	78·0	70·9	72	S. S. E.	146	....	Light clouds.
9	30·002	86·1	70·5	79·1	72·7	74	S. E.	113	....	Fine, with passing clouds.
10	30·014	86·4	71·9	78·4	71·3	72	E. S. E.	121	.....	Fine, with passing clouds.
11	30·006	85·8	71·2	77·6	70·3	70	S. E.	101	....	Light passing clouds.
12	29·964	85·9	69·5	78·7	72·5	74	S. S. E	154	....	Fine.
13	29·936	86·9	71·6	78·7	73·2	77	S. S. E.	178	.....	Fine.
14	29·977	86·5	71·4	79·2	73·2	76	S. S. E.	196	....	Fine.
15	29·972	87·2	70·8	78·9	73·0	76	S. S. E.	196	....	Fine.
16	29·931	86·4	70·9	79·8	73·7	76	S. S. E.	219	....	Fine.
17	29·909	89·5	73·6	80·7	74·4	75	S. S. E.	206	....	Fine.
18	29·917	88·3	75·8	80·6	73·8	73	S. by E.	225	....	Fine day, cloudy night.
19	29·936	87·5	73·1	80·7	73·9	73	S. S. E.	201	....	Light clouds.
20	29·897	89·8	72·7	80·7	75·3	78	S. S. E.	192	....	Light clouds.
21	29·838	87·4	76·3	80·9	75·1	77	S. S. E.	208	....	Passing clouds.
22	29·868	87·0	75·6	81·0	73·8	71	S.E.byS.	194	....	Light clouds.
23	29·937	87·6	74·8	81·3	73·9	71	S. E.	140	....	do.
24	29·947	87·5	74·8	81·2	74·1	72	E.	160	....	Cloudy.
25	29·918	86·8	73·0	79·9	73·7	75	E.	116	....	Light clouds.
26	29·924	87·1	73·8	80·8	72·7	69	E. S. E.	118	....	Fine day, cloudy night.
27	29·915	88·4	76·8	81·9	74·5	71	E. by S.	167	....	Cloudy.
28	29·940	87·7	77·1	82·2	74·5	70	E. S. E.	160	....	Passing clouds.
29	29·930	87·7	77·4	82·7	75·5	72	E. by S.	181	....	do.
30	29·895	88·0	77·4	82·8	75·9	73	E.	220	....	Fine, with passing clouds.
31	29·889	88·8	77·6	82·9	75·2	71	E. by S.	156	.....	do. do.

The Standard Barometer and Thermometers are read at 10 A.M., 4 P.M., and 10 P.M., and the Daily Means are obtained by the application of hourly corrections, deduced from twenty years' observations. The Cistern of the Barometer is 27 feet above the level of the Sea, and the Receiver of the Rain-gauge is three feet from the ground. The Wind and Rain registered are for the current civil day—from midnight to midnight.

N. R. POGSON, *Government Astronomer.*

PART IV.

MEDICAL INTELLIGENCE.

Revised Scale of Medical Salaries.

THE following is the General Order of the Supreme Government, laying down the revised scale of Salaries for Medical Officers in the Indian Service:—

" In continuation of a Government General Order, dated 23rd December 1864, and in accordance with instructions received from the Right Hon'ble the Secretary of State for India, His Excellency the Governor-General in Council has been pleased to lay down a revised scale of consolidated salaries for officers of Her Majesty's Indian Medical Service.

2. The number of medical officers allowed for each Presidency town with its immediate suburbs, and the allotment of duties amongst them, are based on the recommendations of the Commission appointed to take this subject into consideration; but it will be open to the local Governments to modify the proposed allotment of duties, in such manner as from time to time may seem most desirable, with reference to the convenience of the service, provided the prescribed number of officers and the aggregate of salaries is not exceeded.

3. The appointment of Presidency Surgeons in Calcutta will eventually cease to exist, the duties being performed by the several medical officers holding appointments at the Presidency who are not debarred from private practice. These officers will be required to attend those servants of Government entitled to gratuitous aid, who may seek their services, and also to serve in rotation as members of standing and other medical committees.

4. Present incumbents for these or other appointments which it is proposed to abolish or absorb, will not necessarily be affected at present, and during the gradual introduction of the new arrange-

ments, the cases of any medical officers who are unable to take up the whole of the duties assigned to them, will be individually and specially considered.

5. Officers holding the appointments of Principals of Medical Colleges, Principal Medical Store-keepers, Resident Medical Officers in Colleges and Hospitals, Secretaries and Statistical Officers to Inspectors General, Secretaries Sanitary Commissioners, or Examiners of Medical Accounts, are debarred private practice. This rule will not, however, be enforced in the case of any present incumbents who may have received authoritative permission to engage in such practice.

6. Medical officers holding appointments at the Presidency, and not provided with public quarters, will be granted Presidency house-rent according to relative rank, and on the scale granted to officers of the Staff Corps holding appointments at the Presidency towns.

The grant of Presidency house-rent is limited, however, to salaries not exceeding Rs. 1,400 per mensem.

7. The allotment of civil stations and residency charges to their respective classes will be notified hereafter.

8. In order to render this scale of Indian medical salaries more complete, the salaries of the administrative appointments and regimental charges already provided for in Government General Orders No. 1060 of 1864 and No. 901 of 1866, have been included.

9. Officers of the Indian Medical Service will be on the same footing as military staff officers as regards pay and allowances to be drawn while absent on leave,—the pay of their rank as laid down in para. 29 of Government General Order No. 1060 of 23rd December 1864, being in all cases taken as the basis of the calculation of the moiety due to the absentee and to the officer officiating,—present incumbents being allowed the privilege of receiving, during such absence, either the allowance thus due to them under the military regulations under the revised scale of regimental pay and staff salary, or that to which they would have been entitled under the old scale both of pay and staff allowance.

10. The scale of salaries now sanctioned will be brought into operation from the 13th of November 1866, the date of the receipt of the instructions of the Right Hon'ble the Secretary of State, and be made to apply in all cases where there is no reduction in the present aggregate salary.

11. Present incumbents, whether drawing the old regimental rate of pay with, or the new regimental rate of pay without, staff salary, will have the option of retaining such rates, if more beneficial than those now ordered, except in cases where the salaries have been specially fixed, pending the revision now brought into effect.

ADMINISTRATIVE STAFF.

Appointments.	Presidencies.	Salaries.			
		Surgeon-Major.	Surgeon.	Assistant Surgeon above 5 years.	Assistant Surgeon under 5 years.
		Rs.	Rs.	Rs.	Rs.
Inspector General ...	Bengal ...	...	...	2,700	...
Do do ...	N. W. P.				
Do do ...	Madras.	...	...	2,500	...
Do do ...	Bombay.				
Deputy Inspector General ...	All Presidencies.	...	...	1,800	...
Secretary to the Inspector General.	Bengal...				
Secretary and Statistical Officer to the Inspector General .	Madras..	1,400	1,200	1,000	850
	Bombay.				
Statistical Officer to the Inspector General ...	Bengal ...	1,250	1,050	850	700
Secretary to the Sanitary Commissioner ...	„ ...	1,400	1,200	1,000	850
	Madras . Bombay.	1,250	1,050	850	700
Military Appointments.					
Principal Medical Storekeeper and Professor of Materia Medica in the Medical College	Bengal ...	1,400	1,200	...	...
	Madras . Bombay .	1,250	1,050	850	700
Garrison Surgeon Fort William...	Bengal ...	1,200		...	...
Do do Allahabad ...	„ ...	1,200	1,000	...	...
Garrison Surgeons at other stations	All Presidencies.	1,050	850	650	500
Garrison Assistant Surgeon when in substantive charge ...	„ ...	...	...	650	500
Garrison Assistant Surgeon when under a Surgeon ...	„ ...	...	...	600	450
Staff Surgeon and Medical Storekeeper ...	„ ...	1,200	1,000	800	650
Medical charge of a Native Regt. With Horse Allowance in Cavalry Regiments of Rs. 90 for a Surgeon Major or Surgeon, and Rs. 60 for an Assistant Surgeon.	„ ...	1,000	800	600	450

Appointments.	Presidencies.	Salaries. Surgeon-Major.	Surgeon.	Assistant Surgeon above 5 years.	Assistant Surgeon under 5 years.
		Rs.	Rs.	Rs.	Rs.
Charge of a Stud Depôt or Remount Agency. When a substantive charge.	All Presidencies	As Regimental charge.			
Examiner of Medical Accounts ...	" ...	A Staff salary of Rs. 400 per mensem with unemployed pay of rank.			
Surgeon to His Excellency the Commander-in-Chief in India, with Medical charge of Head Quarters Staff and Establishments ...		Rupees 1,000			
Principal of Medical College, Professor of Medicine and 1st Physician of College Hospital ...	Bengal ...	...	1,800	......	......
Principal of Medical College, Professor of Medicine and Physician to General Hospital ..	Madras	...	1,600		
Principal of Medical College, Professor of Medicine and Physician Jamsetjee Jheejeebhoy Hospital ...	Bombay				
Full Professorships in Medical Colleges with conjoint Presidency duties, viz.					
Second Physician College Hospital, Professor of Medical Jurisprudence, Surgeon to the Mint and Customs ...	Bengal...	1,350	1,050	850	700
Senior Surgeon College Hospital, Professor of Surgery ...					
Second Surgeon College Hospital, and Professor of Anatomy ...					
Ophthalmic Surgeon, Marine Surgeon, and Professor of Ophthalmic Surgery ..					
Obstetric Physician, Professor of Midwifery and Superintendent of Vaccination ...					
Chemical Examiner and Professor of Chemistry ...					

Appointments.	Presidencies.	Salaries.			
		Surgeon-Major.	Surgeon.	Assistant Surgeon above 5 years.	Assistant Surgeon under 5 years.
		Rs.	Rs.	Rs.	Rs.
Surgeon of the General Hospital and Professor of Surgery in the Medical College ...	Madras...				
Fort Surgeon with Port and Marine duties and Professor of Anatomy in the Medical College ..					
Ophthalmic Surgeon, Professor of Ophthalmic Surgery and Physiology ...		1,250	1,050	850	700
Superintendent of Lying-in-Hospital, Professor of Midwifery and Surgeon to the Penitentiary ...	Bombay.				
Second Physician to Jamsetjee Jheejeebhoy Hospital and Professor of Physiology in the Medical College ...					
Senior Surgeon to Jamsetjee Jheejeebhoy Hospital, with Medical charge of the Byculla Schools and Professor of Surgery in the Medical College ...					
Second Surgeon to Jamsetjee Jheejeebhoy Hospital, Surgeon to the Coroner and Professor of Anatomy ...					
Chemical Analyzer to Government and Professor of Chemistry ...					
Occulist, Professor of Ophthalmic Surgery with Medical charge of the Jail and House of Correction.					
Minor Professorships, viz., Botany, Hygiene, Dental Surgery, Medical Jurisprudence, and Comparative Anatomy. — Provided the aggregate salary of the Officers holding the post as an extra charge does not exceed that of a full Professorship with attached duties.	All Presidencies.	Rs. 200 Staff salary.			

Appointments.	Presidencies.	Salaries.			
		Surgeon Major.	Surgeon.	Assistant Surgeon above 5 years.	Assistant Surgeon under 5 years.
		Rs.	Rs.	Rs.	Rs.
Resident Physician College Hospital and Professor of Pathology ..	Bengal......	....	....	....	800
Resident Surgeon College Hospital and Professor of Physiology ...	Bengal......	1,250	1,050	....	....
Surgeon of the General Hospital .	Bombay....				
Senior Assistant Surgeon, General Hospital, with attached duties ...	Bengal......	....	....	....	900
Junior ditto ditto ...	„				
Assistant Surgeon General Hospital, in charge of Out-patients and Professor of Pathology Medical College ...	Madras..	....	....	....	800
Assistant Surgeon General Hospital, and Professor of Pathology in the Medical College ...	Bombay..				
Principal Lahore Medical School and Professor of Surgery and Medicine ...	Bengal	1,400	1,200	....	....
Professor of Chemistry and Botany in Lahore Medical School and Chemical Examiner, Punjaub ..	„	1,250	1,050	850	700
Chemical Examiner, N. W. Provinces ...	„	1,050	850	650	500
District Surgeons with attached duties, namely,					
1st District, Inspector of Emigrants, Surgeon to Native Infirmary, Leper Hospital, Idiot Asylum, and Black Town Dispensary ...	Madras..	1,050	850	650	500
2nd District, Surgeon to Female Orphan and Lunatic Aslyums, Gun Powder and Gun Carriage Factories and Vepery Dispensary ..					
3rd District, Surgeon to Male Orphan Asylum and Chintadrepet Dispensary ...					
4th District, With charge of Trip'icane Dispensary ...					
Presidency Surgeons with Professorships and attached duties, viz.					

Appointment.	Presidencies.	Salaries. Surgeon-Major.	Surgeon.	Assistant Surgeon, above 5 years.	Assistant Surgeon under 5 years.
1st, Presidency Surgeon, and Professor of Medical Jurisprudence. 2nd, Presidency Surgeon, and Professor of Midwifery ... 3rd, Presidency Surgeon, Garrison and Marine with charge of Officers' Hospital ...	Bombay.	1,050	350	650	500
Medical Superintendent at Aden... ,, at Port Blair ...	Bombay. Madras.	...	1,200	...	...
Surgeon of the Lunatic Asylum..	Bombay.	1,050	850	650	500
Do. to the Viceroy and Governor General ...	Bengal.	...	...	1,200	...
Do. to the Governor with Medical charge of the Body Guard ... Do. to the Governor with Medical charge of the Body Guard ...	Madras. Bombay.	...	...	1,000	...
Superintendents General of Vaccination ...	All Presidencies	1,250	1,050	850	700
Superintendents of Vaccination ...	,,	950	750	550	400
Medical charge of 1st class Civil Stations. — With an extra allowance for charge of Lunatic Asylums, Colleges or Administrative charge of Jails, which will be fixed in the Civil Department.	,,	1,050	850	650	500
Do. 2d do	,,	950	750	550	400
Residency Surgeon. ...	,,	As first or second class Civil Surgeons.			

ALLOWANCES FOR ADDITIONAL CHARGES

In cases where no portion of the Staff salary of the absentee is available.

		Rs.
Medical charge of an extra Native Regiment ...	All Presidencies...	100
,, of extra Wing of a Native Regiment or of a Detachment consisting numerically of not less than a Wing ...	,,	75
,, of a Civil Station by a Regimental Medical Officer, or of a Regiment by a Civil Surgeon, in addition to his own duty ...	,,	100

ALLOWANCES FOR EXTRA CHARGES

Payable wholly to the Officer in actual performance of the duty.

			Rs.
Medical charge of a Store Depôt	...	All Presidencies ...	100
,, of a Stud Depôt	...	,, ...	50
Medical charge of Divisional Staff and Medical charge of Brigade or station Staff	As Stations where there is no "Garrison Surgeon," or "Garrison Assistant Surgeon" or "Staff Surgeon and Medical Store-keeper." ...	,, ..	100
		,, ...	30
Medical charge of a Lock Hospital	1st Class ...	,, ...	100
	2nd Class ...	,, ...	50

H. K. Burne, Lieut.-Col.,

Offg. Secy. to the Govt. of India.

Classification of the Civil Stations of the Madras Presidency, with reference to the preceding Rules regarding Pay of Medical Officers.

Proceedings of the Madras Government, 17th June 1867.

Read the following letter from the Inspector General, Indian Medical Department, dated Fort St. George, 4th June 1867, No. 209.

I have the honor to acknowledge receipt of your Memorandum of 31st May 1867, referring letter No. 1144, dated Fort William, 30th March 1867, from the Officiating Secretary to the Government of India, Military Department, for my remarks, and, in obedience thereto, I beg to submit a list of the civil stations in this Presidency which appear to me to require Covenanted Medical Officers, arranged in two classes, as determined in paragraph 4 of the above letter.

2. In explanation of this list, I have the honor to state that the Madras Government, in their Proceedings and Order thereon, No. 139, of 8th February 1867, have approved of the Medical Officers at Ootacamund being placed "in the 250 Rupees class," for the reason that "the duties of both are as nearly equal as possible ;" on this account I am of opinion that both appointments should stand in the same category, viz., the 1st class of the Officiating Secretary's letter.

3. The next nine stations in my list have been similarly classified by the Special Committee—that is, in the 2nd class of their

report, which I presume is to be considered as equivalent with class 1st of the present Despatch of the Government of India.

4. I have transferred Rajahmundry from the 2nd to the 1st class, as its duties are now fully as important as those of any of the other stations in this class. They embrace charge of a Central and District Jail, a Civil Dispensary, Police Hospital, and the usual Head Quarter Civil Establishments.

5. Vellore has not hitherto been a station for a separate Civil Medical Officer ; but, so soon as the Central Jail, now in course of being built, at a distance of about 2½ miles from the Military Cantonment, is completed, the duties cannot be performed by one individual. They will then consist of (for the Civil Medical Officer) charge of the Central Jail, the Garrison Hospital, Civil Dispensary, and Police Hospital, with the establishment belonging to the Session Judge, which will be so extensive as, in my opinion, to justify the station being placed in the 1st class.

6. Thirteen stations fall into the 2nd class ; of these, Cuddapah and Tellicherry are at present held by intelligent and experienced Native Surgeons ; Coconada by an Apothecary ; and Berhampore by a member of the Subordinate Medical Establishment, who is also a graduate of one of the British Universities.

7. Rajahmundry is also at present in charge of an Apothecary ; but, for the reasons already stated in paragraph 4 of this letter, I desire to have a Covenanted Medical Officer posted to it as soon as possible.

8. The exigencies of the Service require that the Native Surgeon at Tellicherry should be sent back to his substantive appointment at Trichinopoly, his place at Tellicherry being taken by an Assistant Apothecary ; but I submit that, so soon as Covenanted Medical Officers are available, Tellicherry, Cuddapah, and Berhampore, from their size and the nature of their duties (having each, in addition to the regular civil establishments, a Civil Dispensary and District Jail), should again become stations for members of the commissioned rank.

9. The other civil stations now in charge of Medical Subordinates are Chicacole and Chetterpore. These and Cocanada may, I think, continue to be so held.

10. I quite concur in opinion with my predecessor that Madras is never, or at all events not for very many years to come, likely to have a large number of Uncovenanted Medical Officers or of graduates of the local University, and that we must, therefore, look to the Medical Subordinate Department for men to hold the more important of our minor charges, as well as to take up the larger civil stations, whenever the necessities of the service may require the withdrawal of their Medical Officers for other duty.

11. The reasons why Military and Civil duties should not, as a rule, be performed by one individual, are so fully stated in Mr. Shaw's letter, under date 20th July 1866, and so I entirely agree in his observations, that, on this point, I have only to state my conviction that the arrangement of uniting both appointments in one Officer is undesirable, and would not work satisfactorily in this Presidency.

12. With reference to paragraph 6 of the Officiating Secretary's letter, and the desire of the Right Honorable the Governor-General in Council for a re-consideration of the necessity for separate Medical Officers for the civil stations of Rangoon and Moulmein, I am aware that Mr. Shaw was strongly of opinion that the civil duties of Rangoon might very well be performed by the Staff Surgeon, as is the case at Bellary and Trichinopoly. But since the Chief Commissioner of Burmah, to whom the requirements of both stations must be best known, is of opinion that the combined civil and regimental duties could not possibly be performed by one Officer, this office has no objection to offer to the nomination of separate Medical Officers for the civil duties; and I would recommend that Rangoon, as being the larger and more important station, be placed in the 1st, and Moulmein in the 2nd class.

List of civil stations classified as directed in paragraph 5 of Despatch from Officiating Secretary to the Government of India, No. 1144, of 30th March 1867.

1st Class.—Ootacamund.—Two. Coonoor and Kotagherry, Cochin, (Trichoor and Palliport, Calicut); (Leper and Small-pox Hospitals); Madura, Coimbatore, Salem, Cuddalore, Vizagapatam, Kurnool, Rajahmundry, and Vellore.

2nd Class.—Chingleput, Cuddapah, Nellore, Mangalore, Masulipatam, Tanjore, Tellicherry, Tinnevelly, Chittoor, Coconada, Guntoor, Berhampore, Tranquebar, and Negapatam.

(Signed) W. MACKENZIE, M.D.

Inspector General, Indian Medical Department.

Fort St. George, 4th June 1867.

From the Accountant General, Madras, to the Chief Secretary to Government, Fort Saint George; dated Fort Saint George, 31st May 1867, No. 79.

With reference to paragraph 7 of G. O. G. G., No. 370, dated 4th April last, Military Department, re-published in the Financial Notification, No. 2294, of 25th idem, I have the honor to request that I may be informed, at an early date, of the classes into which the several Civil Surgeoncies in this Presidency have been divided. Several Medical Officers have drawn pay at the new rates, which I am unable to check, owing to want of information on this subject.

ORDER THEREON, 17th June 1857, No. 702.

The Governor in Council approves of the classification of civil stations at which Commissioned Medical Officers are to be employed, as proposed in the foregoing letter.

2. The arrangements proposed by Dr. Mackenzie are sanctioned, subject to the confirmation of the Government of India, and with the remark that the Court at Vellore is not a Session Court but a Court of Small Causes.

The British Army Medical Department.

The following Royal Warrant, dated April 1, 1867, revising the pay and half-pay of medical officers of the army, has been promulgated :—

VICTORIA R.—Whereas we deem it expedient to revise and amend the regulations for the pay and half-pay of the medical officers of our army, our will and pleasure is that Articles 283 to 298 of our Royal Warrant of the 3rd of February, 1866, and so much of our Royal Warrant of the 1st October, 1858, as affects the half-pay and retired pay of the said officers, be cancelled, and that instead thereof, this our present warrant be established and obeyed as the sole authority on the matters herein treated of : —

1. The daily rates of pay of the officers of the medical branch of the hospital department of our army shall be as follows :—

Medical Staff—Director-general, special ; inspector-general, 2*l.* ; after 25 years' service, 2*l.* 5*s.* ; after 30 years' service 2*l.* 7*s.* ; after 35 years' service, 2*l.* 10*s.* Deputy inspector-general, 1*l.* 10*s.* ; after 25 years' service, 1*l.* 12*s.* ; after 30 years' service, 1*l.* 15*s.* ; after 35 years' service, 1*l.* 17*s.* Surgeon-major, 1*l.* 4*s.* ; after 25 years' service, 1*l.* 7*s.* Surgeon, 17*s.* 6*d.* ; after 15 years' service, 20*s.* 6*d.* Assistant-surgeon on appointment, 10*s.* ; after 5 years' service 12*s.* 6*d.* ; after 10 years' service, 15*s.* ; after 15 years' service, 17*s.* 6*d.*

Charge Pay—The officer in medical charge of an army in the field, of 10,000 men and upwards, 1*l.* daily ; of 5,000 men and upwards, 15*s.* daily ; of less than 5,000, 10*s.* daily. Or in medical charge of a colony where the number of non-commissioned officers and enlisted men is 1,500 and upwards, 5*s.* daily.

General Hospital Staff—Governor and commandant, staff captain and assistant-commandant, and acting governor, special ; captain orderlies, 6*s.* 6d. per day ; after 5 years' service, 8*s.* ; after 10 years' service, 10*s.*

Apothecaries—Apothecaries, 9*s.* per day ; after 5 years' service, 10*s.* 6*d.* ; after 10 years' service, 12*s.* ; after 15 years' service, 13*s.*

6*d.* ; after 20 years' service, 15*s.* ; after 25 years' service, 16*s.* 6*d.*; after 30 years' service, 18*s.*

2. Every candidate to be admitted to the competitive examination for a commission as assistant-surgeon in our army, shall be unmarried, and shall possess such a certificate or certificates as would qualify a civilian to practice medicine and surgery in Great Britain and Ireland ; and before receiving a commission shall pass an examination in military medicine, surgery, hygiene, and pathology, after attending the authorized course in a general military hospital.

3. Any assistant-surgeon shall pass such examination as our Secretary of State for War may require, and shall have served on full-pay with the commission of assistant-surgeon for five years, of which two shall have been passed in or with a regiment, or depôt battalion, before he can be promoted to the rank of surgeon.

4. Assistant-surgeons shall, as a general rule, be promoted to the rank of surgeon in the order of their seniority in the service, unless unfit for the discharge of their duties from physical or professional incompetence or misconduct. In cases of distinguished service, however, an assistant-surgeon may be promoted without reference to seniority ; and in such cases the recommendation describing the services for which the officer is proposed for promotion shall be published in the general orders of the army and in the *Gazette* in which such promotion shall appear.

5. A surgeon after 20 years' service in any rank shall be styled surgeon-major, but a surgeon of less than 20 years' full-pay service may be promoted to the rank of surgeon-major for distinguished service. The recommendation detailing the services for which the officer is proposed for promotion for distinguished services shall be published in the general orders of the army, and in the *Gazette* in which such promotion shall appear.

6. A surgeon must have served ten years in our army with a commission on full pay, of which period two years must have been passed with the rank of surgeon in or with a regiment or depôt battalion, before he can be promoted to the rank of deputy inspector-general of hospitals.

7. All promotion from the rank of surgeon or surgeon-major to that of deputy inspector, and from the rank of deputy-inspector to that of inspector, shall be gained by selection for ability and merit, the selection being made from the whole rank of surgeons, whether styled surgeons or surgeons-major, and the grounds of such selection shall be stated to us in writing, and recorded in the office of our Commander-in-Chief.

8. A deputy inspector-general of hospitals must have served five

years at home or three years abroad in that rank before he can be promoted to the rank of inspector-general.

9. Our Secretary of State for War, in cases of emergency, may shorten the several periods of service above mentioned, as he shall deem expedient for the good of our service.

10. Good service pensions shall be awarded to the most meritorious medical officers of our army, under such regulations as shall be from time to time determined by us, with the advice of our Secretary of State for War. Six of the most meritorious medical officers of our army shall be named our honorary physicians, and six our honorary surgeons.

11. Medical officers shall have the right to retire on half-pay, after 20 years' service; medical officers of the rank of surgeon-major, surgeon, or assistant-surgeon, shall be placed on the retired list at the age of 55, and all inspectors-general and deputy inspectors-general at the age of 65 years.

12. Our Secretary of State for War may, when he shall deem it fit, employ officers of the medical branch of our hospital department in sundry situations, at such daily rates of pay, in addition to half-pay, as he shall from time to time determine.

13. A medical officer who having voluntarily resigned his commission has subsequently been permitted to re-enter the army shall not, except under very special circumstances, to be approved by our Secretary of State for War, be allowed to reckon his former service.

14. An Apothecary shall have the right to retire on half-pay after 30 years' good service.

Service on the West Coast of Africa.—15. A medical officer volunteering for service on the West Coast of Africa shall, in order to come under the provisions of the two following articles, serve on the coast for a period of at least 12 months, and shall be governed by the following regulations :—

16. Each year of such service shall be allowed to reckon towards promotion and retirement as two years of ordinary service, but it shall not so reckon towards increased pay or qualification for the rank of surgeon-major. If an officer shall be permitted at his own wish to prolong his stay on the coast, his further service shall be allowed to reckon in proportion.

17. For each year's service on the coast a medical officer shall be entitled to a year's leave at home, and for every additional period beyond a year he shall have an equivalent extension of leave. Non-effective pay.

18. A medical officer placed on half-pay by reduction of establishment, or, on the report of a medical board, in consequence of wounds or ill-health caused in and by the discharge of his duties,

or on account of age (under Article 11), shall be entitled to half-pay at the following daily rates :—*Inspector-General*—After 30 years' service, 1*l.* 17*s.* 6*d.* ; after 25 years' service, 1*l.* 13*s.* 6*d.* ; after 20 years' service, 1*l.* 10*s.* *Deputy Inspector-General*—After 30 years' service, 1*l.* 5*s.* 6*d.* ; after 25 years' service, 1*l.* 2*s.* 6*d.* ; after 20 years' service, 1*l.* 1*s.* *Surgeon-Major*—After 25 years' service, 1*l.* ; after 20 years' service, 16*s.* 6*d.* *Surgeon*—After 15 years' service, 13*s.* 6*d.* ; after 10 years' service, 11*s.* *Assistant-Surgeon*—After 10 years' service, 10*s.* ; after 5 years' service, 8*s.* ; under 5 years' service, 6*s.*

19. The rate of half-pay awarded to officers retiring for their own convenience, after 20 years' service on full-pay, shall not exceed one-half of their full-pay at the time of retirement.

20. Every medical officer who shall retire after service upon full-pay for 25 years shall be granted a rate of half-pay equal to 7-10ths of the daily pay he may last have been in receipt of when thus retiring or proceeding on half-pay, provided he shall have served 3 years in his rank, or shall have served abroad for 10 years in all ranks, or for 5 years with an army in the field. An officer of 25 years' full-pay service whose service falls within neither of these conditions shall be entitled only to 7-10ths of the daily pay he was in receipt of prior to his last promotion.

21. A medical officer placed on half-pay from any other cause shall be allowed only a temporary rate of half-pay (not exceeding the rates specified in Article 18) for such period and at such rate as our Secretary of State for War shall decide with reference to the services rendered to the public by such officer.

22. Medical officers of 20 years' full-pay service placed temporarily on half-pay, under Article 21, on account of ill-health may, however, be allowed to retire on permanent half-pay at the rate fixed by Article 18, if after one year on half-pay they shall be reported by a medical board to be permanently unfit for further service.

23. An apothecary shall be granted pay at the following daily rate, if placed on half pay by reduction of establishment, or on account of age (under Article 14), or through ill-health, certified to the satisfaction of our Secretary of State for War to have been contracted in and by the service :—Apothecary to the Forces, after 30 years' service, 9*s.* per day ; after 25 years' service, 8*s.* per day ; after 20 years' service, 7*s.* per day ; after 15 years' service, 6*s.* per day ; after 10 years' service, 5*s.* per day.

Given at our Court at St. James's, this 1st day of April, 1867, in the thirtieth year of our reign. By her Majesty's commands,

J. S. PAKINGTON.

Mortality of Troops in India.

We take the following from the *Overland Mail* of May 3d :—

"The return of the sickness and number of deaths among the troops serving in India from 1858 to 1865, prepared by the India Office, shows the effect of climate on European, as compared with native troops in each presidency. In Bengal, in 1865, out of an average strength of 38,967 European troops, there were 65,561 admissions to hospital, 913 deaths, including 114 from cholera, and 1,923 invalided. Out of an average strength of 39,891 native troops, there were 68,960 admissions to hospital, 1,098 deaths, including 193 from cholera, and 680 invalided. In Madras, in 1865, out of an average strength of 13,623 European troops, there were 19,433 admissions into hospital, 267 deaths, including 36 from cholera, and 508 invalided. Out of 29,766 native troops, there were 21,367 admissions into hospital, 397 deaths, including 135 from cholera, and 413 invalided. In Bombay, in 1865, out of an average strength of 11,815 European troops, there were 17,625 admissions into hospital, 405 deaths, including 189 from cholera, and 373 invalided. Out of 24,729 native troops, there were 26,339 admissions into hospital, 371 deaths, including 126 from cholera, and 1,015 invalided. The aggregate for the three presidencies was as follows :—Out of an average strength of 64,405 European troops in 1865, there were 102,619 admissions into hospital, 1,585 deaths, including 339 from cholera, and 2,804 invalided; while out of 94,386 native troops, there were 116,666 admissions into hospital, 1,866 deaths, including 454 from cholera, and 2,108 invalided."

We have not yet received the Army Statistical Reports for the year 1864, but in order to compare the foregoing figures with the Returns for the year 1863, we have found the proportion per 1,000 of strength under the following heads :—

Admitted, Died, Invalided, per 1,000 *of Strength in* 1865.

Presidency.	Troops.	Admissions.	Deaths from: Cholera.	Deaths from: Other Diseases.	Deaths from: All Diseases.	Invalided.	Total loss by Death and Invaliding.
1865.							
Bengal...	Europeans..	1682·475	2·926	20·504	23·430	49·349	72·778
	Natives. ...	1728·710	7·345	20·180	27·525	17·046	44·571
Madras...	Europeans.	1426 550	2·643	16·956	19·599	37·289	56·889
	Natives. ...	719·512	4·535	8·802	13·337	13·875	27·212
Bombay....	Europeans..	1491·781	15·997	18·281	34·278	31·570	65·848
	Natives. ..	1065·106	5·095	9·907	15·002	41·045	56·047
Total...	Europeans.	1593·323	5·263	19·346	24·609	43·537	68·146
	Natives. ...	1236·052	4·810	14·949	19·769	22·334	42·103

Presidency.	Troops.	Admissions.	Deaths from Cholera.	Deaths from Other Diseases.	Deaths from All Diseases.	Invalided.	Total loss by Death and Invaliding.
1863.							
Bengal...	Europeans.	1759·5	3·69	22·57	26·26	33·23	59·49
Madras............	Do. ...	1254·6	3·72	18·39	22·11	40·09	62·20
Bombay...	Do. ...	1590·8	0·65	15·49	16·14	32·52	48·66
Total...	Europeans.	1634·	3·15	20·49	23·64	34·39	58·03

Comparing the Returns of Europeans for 1863 with those for 1865 there will be found a close correspondence between the admissions and total deaths per 1,000 of strength; the actual result being that in the latter year there were 30 per mille less admissions, with 1 per mille increase of deaths.

Looking a little further into the table it will be seen that the outbreak of cholera in Bombay, producing a mortality of 15·997 per mille in 1865, more than accounts for the increase in the total deaths; for, excluding cholera, the deaths were 1·15 per mille less in 1865 than in 1863.

The Invaliding of 1865 shows an increase of 9·16 per mille over that of 1863, but the term "Invalided" requires some explanation. As given in the above tables it includes all men sent home either for change of air or for discharge, and the returns for 1863 show that not much more than one-half of those sent home are actually discharged from the service; so that it is a mistake to reckon invalids as total losses to the service.

We think the British army in India is to be congratulated upon the figures given above, as they show a very decided improvement in the health and death-rate of the troops. For the Report of the Commissioners on the Sanitary State of the Army in India, May 1863, gives the proportion per 1,000 of admissions into Hospital, from 1800 to 1858, as 2,054, and the deaths as 69, whereas in 1865 the total deaths and invaliding only amounted to a fraction over 68, being 10 per mille more than in 1863.

We must own we were not quite prepared to find that the native army in Bengal experienced so considerable a sickness and death-rate in 1865. A mortality of 27·525 per

mille appears very high for a native army, but probably there is some cause, with which we are not acquainted, to account for this. At all events it does not appear to have led to a proportionate degree of invaliding. During 1865 the Madras troops both European and native, appear to have enjoyed a greater share of health and a less mortality than those of the other presidencies. The invaliding of the native army in Bombay appears high, perhaps "reduction of strength" has led to this.

We trust that when the administrative staff of the British Medical Service in India has got into working order, there will not be quite so much delay in the publication of the Returns; and we hope that the tables furnished by both the British and Indian Department will be constructed on one uniform plan so as readily to allow of comparison.

Madras Medical College: Dr. H. King's Valedictory Address.

The Medical College Anniversary Meeting, on the closing of session 1866-67, was held in the Memorial Hall on Friday evening, 28th June 1867. The Right Honorable the Governor of Madras in the chair. After the reading of the Report and the distribution of the prizes and certificates to the successful students, Dr. H. King, Acting Professor of Midwifery, delivered the following address:—

Your Excellency and Gentlemen,—I regret very much, more even on your account than on my own, that the custom of the College imposes upon me the duty of addressing a few valedictory words to the pupils, who, having completed, so far as it can be completed here, their professional education, are about to enter upon the duties of their lives. To give good advice is proverbially an easy task; but to give it persuasively and effectively is by no means easy, nor can I hope to succeed so well as any of those who have preceded me in the performance of this duty.

Assistant Apothecaries and Hospital Assistants,—You, who are leaving the state of pupilage and entering upon the course of your future career, I congratulate on the successful termination of your preliminary studies. Preliminary only if your teachers have succeeded as they desired and strove to succeed. They have not merely taught you, but taught you how to learn for yourselves. The art which you are to practise, and the science on which your art is founded are essentially progressive. It may be your privilege to

assist in the progress of medicine—it may be your lot to have opportunities of keeping yourselves acquainted with every onward step which the leaders among your brethren are taking every day; —but whether you have the good fortune to be yourselves discoverers or not—whether your own circumstances will be such as to enable you to maintain your own professional knowledge on a level with the improvements and discoveries of the day not—your lives must in any case be passed in study if you will become worthy members of the profession you have chosen. Study of the ever varying phenomena of disease, as modified by endemic or epidemic influences, by idiosyncracy, by treatment; minute observation of the action of each remedy, or combination of remedies you employ; efforts to acquire the power of distinguishing accidental sequences of events from that invariable sequence which constitutes the relation of cause and effect;—these and similar tasks must occupy us all until we cease to heal and can no longer ourselves be healed. Some are more highly gifted than the rest, detecting changes too minute for ordinary perception, and forseeing with almost intuitive sagacity results hidden from their less favored brethren; but even they, well fitted as they are to instruct others, are not less conscious than we of the necessity for unceasing study—not less eager in the pursuit of higher and fuller knowledge. Knowledge has been well defined to be "Belief of what is true on sufficient grounds." Truth is the object of every science; but in ours it is more than ordinarily difficult, and, at the same time, more than ordinarily important, to ascertain the sufficiency of the grounds upon which an asserted "truth" is based. To eliminate the well known fallacy—*post hoc ergo propter hoc*, which doth so easily beset us, which underlies and vitiates so many supposed discoveries in medicine, itself demands the closest and most cautious attention to the phenomena of health and disease. This, however, is but one of many possible illustrations of the fact which I entreat you never to forget; that your studies are not now over, that they will end only with your professional lives.

Of the duties of your positions as merely Medical Subordinates, I do not propose to speak. How these are to be performed, you had an opportunity of hearing in last year's able address. They are summed up in three words—industry, sobriety and obedience. Those duties are to be done, and faithfully; but I do not understand it to be either the intention or the wish of the Government to which you owe your education that you of the warrant grade should restrict yourselves to them. I speak to you, Assistant Apothecaries, therefore, as to those who may and ought to aspire to the independent exercise of your art, in such a manner that it shall not interfere with the efficient performance of your work as Government servants.

The duties of our calling fall naturally under three heads, on each

of which I shall say a few words. Preventive Medicine, the Science of Hygiene, and the Art of what I must call Sanitation, for want of a less barbarous term—is first of these logically, though not first historically, nor until recently first in the estimation of the profession or the public. Of late years the theory and practice of preventive medicine have received a powerful impluse, owing to various causes into which it is unnecssary now to enter; and the effect has been felt in this country no less powerfully, perhaps even more powerfully, than in the West. Already we have not only studied, but learned how to avert disease as well as to cure it, and our efforts have borne goodly fruit. Much, however, still remains to do; and there is not one of you who cannot help in the good work. You can help in two ways—by studying the Hygienic peculiarities of the particular places were your lots may be cast, and, secondly, by exerting all the influence you may possess to spread a knowledge of sanitary principles amongst the people, and to induce them to act upon these principles in the habits of their lives. We are all familiar with strange anomalies in this branch of Medicine. We know of places which *ought* to be healthful, so far as our sanitary knowledge goes, but which *are* foci of disease; of others whose inhabitants live and thrive in conditions which ought to be fatal to health and life; of jails where insufficient and unsuitable food, combined with the absence of anything which can be called ventilation, has appeared to be positively conducive to health and length of days; of hospitals whose situation makes a Sanitary Commissioner but shudder, whose inmates obstinately refuse to realize the anticipations of Hygiene, or the fears of philanthropy, by yielding an exaggerated death-rate. To reconcile these and like incongruous facts with the established principles of sanitary science, by discovering secondary causes interfering with the action of the primary, requires multiplied observations of the meteorological and other circumstances of the localities, from which a modifying law may be reduced—itself applicable to other cases. The power of accurate observation, on which depends your success as physicians, will be no less useful in this than in the curative branch of our profession; but the humblest of us can observe something and record it correctly, and every correctly recorded observation may be a help to a useful generalization. If we cannot all build, we may all collect materials for those who can. And note, that in the course of the inquiries I have indicated, you may often obtain a useful hint from the traditions and beliefs of the people. There will often be some substantial reason underlying an apparently national and unaccountable preference of one site or tank or well to another, which we should suppose equally eligible. Such beliefs may be ill-founded, or may be based upon a condition of things which has passed away; but inquiry into the grounds on which they rest should not be deemed beneath your notice.

In carrying into execution the measures which the established principles of sanitary science enjoin, you can all assist. You have an unbounded field for the exercise in this direction of all the influence which you can exert, by precept and by example. The advantages in point of education, not professional only, but also general, which you have enjoyed, impose upon you additional responsibilities, while they necessarily tend, if you use them a right, to increase your influence upon the uneducated masses amongst whom you will have to work, and to augment, proportionately, your power for good. Remember, too, that in this branch of your duty, your efforts will be made principally among the poor. Not that ignorance of the laws of health and destructiveness and stupid conservatism are confined to the poorer inhabitants of this or any country; but because the rich are exempt from many of the temptations to disregard of sanitary laws to which the poor are open. In no part of your professional duties will you stand in greater need of patience and perseverance, of tact and kindly feeling and good temper, than in your efforts to induce your poorer neighbours to abandon time-honoured habits of aversion to ventilation and drainage, to cleanliness of house and person.

However successful our exertions may be in the cause of Preventive Medicine, we cannot hope—we need not fear—that it will ever supersede Therapeutics. While matter lasts, some of it will be found in a wrong place, constituting "Dirt," according to the well-known definition; and disease and death will be the results as now! though, as we believe, and have good reason for believing, in an ever-diminishing degree. The second branch of your professional duty, then, the treatment of disease, must occupy much, nay most, of your attention and your time. It is in the practice of this department of your art that you will reap your richest reward from a consciousness of sufferings alleviated, hearts gladdened, and duty done. Here too your path will lie much among the poor: and if indeed it is "more blessed to give than to receive"—to be the doers than the recipients of good—no calling should be more blest than ours; for none other enjoys such opportunities of adding to the happiness and relieving the suffering of the poor; and none avails itself more nobly or more constantly of its opportunities—"hoping for nothing in return." Familiarity with misery and suffering, with disease and death, will relieve you, indeed, from the painful feelings which they at first excite; but it will, at the same time, stimulate your benevolence and increase your power of doing good. "Let a man," says Bishop Butler, "set himself to attend to, inquire out, and relieve distressed persons, and he cannot but grow less and less sensibly affected with the various miseries of life with which he must become acquainted; when yet at the same time benevolence, considered not as a passion, but as a practical

principle of action, will strengthen : and while he passively compassionates the distressed less, he will acquire a greater aptitude actively to assist and befriend them." Such will, I trust, be your position in relation to the poor.

In curative as in preventive medicine, valuable information may be obtained from the experience of the people. Let me urge upon you the importance of examining into, as opportunity occurs, the very numerous remedies employed, sometimes undoubtedly, with success, by native practitioners. Little, I believe, has yet been done in this matter in comparison with what might have been and will be done. The credulity, absurdity and superstition, with which native therapeutics seems almost inextricably entangled, have obscured many useful truths ; and your leisure hours may be profitably spent in the endeavour to separate the nucleus of truth from the accretions of error and imposture. You will not think it necessary to investigate the therapeutical effect of a peacock's feather round a sick man's leg, any more than a western physician would be justified in testing the efficacy of infinitesimal doses, or of attempting to cure disease through the sense of smell. Besides, however, absurdities manifest as these, we could not *a priori* doubt, had experience not proved the fact, that the native practitioners of this country possess a knowledge not only of drugs, but even (perhaps) of modes of treatment of local disease worthy of your enquiry and study.

The third branch of the duties of our profession need not detain us long. As the first and second concern the preservation and restoration of human health, the third is concerned with the palliation of evils which we cannot prevent or remove, and the smothing of the inevitable path to the grave of those whose downward progress we have been unable to arrest. As it is our privilege to succeed more frequently than we fail in our efforts to restore the sick to health, and to cure our patients many times before the inevitable *once* which must come, sooner or later, to all, this department of our art is of less importance than the therapeutical, and I mention it only to remind you that so long as life remains, your duty to your patient lasts. Though "while there's life there's hope" is often but a broken reed on which the friends of the dying attempt in vain to lean, when to your eye no glimpse of hope is apparent, you can still do much to ensure a painless and a peaceful death.

On the subordinate duties of our profession, which are comprehended under the term "etiquette," much might be said, did time and place permit. The rules which regulate our professional intercourse with each other, with our patients and with the public, have been founded on the experience of centuries and are intended to promote, not our own selfish interests but the greatest good of all. In your professional conduct—as in all your conduct—act honestly

and firmly in obedience to the golden rule, "Whatsoever ye would that men should do unto you do ye even so to them," and you cannot transgress the unwritten code of medical etiquette. However keen may be the "struggle for existence" use no unworthy means to supplant your professional brother. Whisper no derogatory doubt of his skill—nor boast of your own superior knowledge. The choice of a medical attendant rests with the patient or the patient's friends alone. On you no responsibility lies if they choose unwisely; nor are you the most impartial judge of your own merits or rival's failings. That healthy emulation among members of our profession which stimulates us to exertions and results in benefit to ourselves and the community, becomes envy when it seeks to attain one's own elevation by the depression of another. From this grave breach of duty you will be preserved by strict obedience to the rule of which I speak.

Another of these duties which concerns not ourselves only but the whole community, is the avoiding of either the affectation or the reality of secresy with reference to the remedies we employ. There is no more striking or more honorable mark of distinction between us and the charlatans who infest civilization than that we invariably give the widest available publicity to every improvement in our art which we make or think we make: bringing its value to the test of discussion and experiment, and sharing its benefits, if established, with all mankind. The empiric preserves for his own sole advantages the secret whose value he exaggerates for his selfish ends. Each newly discovered truth which it may be our good fortune to extract from nature's mine is ours but at the moment of discovery, the next, it is offered freely to the world.

Of etiquette between physicians and patient, I shall mention but one most important rule. We cannot be too careful to maintain the strictest secresy with reference to the affairs of those who seek our advice. We necessarily, in many cases, become aware of fact and circumstances communicated to us under a seal as sacred as that of the confessional; which would not have been confided to us unless there were full assurance that the confidence *could* not be abused, and to divulge which would be a grievous breach of professional and personal honor. Exceptions may be imagined no doubt, but in practice you will meet with few. Accustom yourself to a belief that there are none and in those rare cases where doubt arises let your feeling—even your prejudice—be against admitting the possibility of exception. In this matter avoid even the appearance of evil. Resist the temptation not only to gossip about your patient's ailments, but even to mention unnecessarily the fact of his illness; or to talk of his affairs with which your position as medical adviser may give you more intimate knowledge, from the mere fact of your being more frequently than others at his house. I have

selected this example of the etiquette of the profession as between physician and patient, because I think it the most important, and that the strict observance of it is most essential to private happiness and public good.

In conclusion, let me urge you ever to remember that we belong—however subordinate or humble our position in the ranks may be—to an honorable profession—to a brotherhood devoted to the pursuit of truth, the preservation of human life, and the alleviation of human suffering. As a profession we have rights to claim no less than duties to perform. Those rights will be best maintained by scrupulous performance of our duties, and by cherishing a feeling of unity and *esprit de corps* amongst ourselves. Always be sensible that your individual short-comings have a tendency to lower the tone and reputation of the body to which from this day you belong. Firm in the consciousness of duty performed to the best of our ability, and of honorable union amongst ourselves, we should never claim in vain that which alone we ask—fair appreciation of what we do and suffer in staying the hand of Death—and relieving the pains and sorrows of our fellow-creatures, with kindly allowance for what we leave undone, through the weaknesses and failures which are incidental to the common lot of humanity.

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